MODERN Machine Shop

June, 1936

40 YEARS
CONTINUOUS SERVICE

Six Machines Equipped with
ARGUTO BUSHINGS
In —— 1911

are still in Place and in Use. Due to Overtime on the basis of a 10-hour day—they have had

40 YEARS
OF SERVICE

ARGUTO

"ARGUTO Bushings have Outlasted 7 Bronze Bushings in the same place . . . very severe service."

Unsolicited Testimonial

20 years without a drink—

ARGUTO OILLESS BEARING CO.

WAYNE JUNCTION PHILADELPHIA

LOGAN

Application of the most moder
dependable and efficient operati
and work-holding devices to yo
equipment is of vast importanc
. . . they contribute immeasurab
to the productive capacity of th
entire unit.

That is why so many manufacture
incorporate LOGAN Air and Hy
draulic-Operated devices in th
design of all types of machine
They know LOGAN equipment
dependable . . . modern . . . w
add to the efficiency of operatio

Authoritative recommendations o
the application of hydraulic an
pneumatic devices to your produ
tion needs will gladly be given b
LOGAN engineers. There's n
obligation.

A few LOGAN cylinders and
valve are illustrated at the
left. We invite you to review
the entire LOGAN line.
Write for Catalogs S-25 and
AH-31.

LOGANSPORT MACHINE W
LOGANSPORT, INDIANA

E. Engineering 10-25-48

MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 9 JUNE, 1936 Number 1

A Magazine for Mechanical Executives: Construction Production Maintenance

Member CCA

More Than 27,000 Circulation Each Issue

CONTENTS

THE MAKING OF GLASSWARE MOULDS 35
By Howard Campbell

MODERNIZING THE TOOL CONTROL SYSTEM 44
By Donald A. Clark

METHODS ENGINEERING PROCEDURE: ENGINEERING FOR QUALITY 52
By H. B. Maynard

NEW DEVELOPMENTS IN THREAD GRINDING 74
By Ira J. Shader

"IDEAS FROM READERS"
—Ball Bearing Stop for Counterbore, By Frederic Wolf 84
—Hardening Hammer Handles, By C. F. Fitz 84
—Belt Width Chart for Short Center Belt Drives, By W. F. Schaphorst 86
—Combination Monkey and Spanner Wrench, By C. F. Fitz 88
—Varying the Rotary Movement by Reciprocating a Helical Gear Axially, By J. E. Fenno 90

"OVER THE EDITOR'S DESK" 98

NEW SHOP EQUIPMENT 100

"THERE'S ONE IN EVERY SHOP", By Wesser 188

INDEX TO ADVERTISEMENTS 190

Published monthly by Gardner Publications, Inc., 704 Race St., Cincinnati, Ohio. Copyrighted.

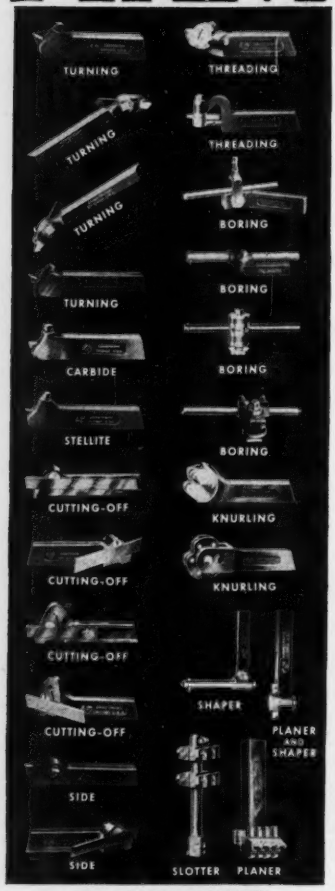
DON G. GARDNER, President and General Manager
JOHN M. KRINGS, National Advertising Manager

IVER W. LEE
Pacific Coast Manager
949 Maple Ave.,
Los Angeles

GEORGE H. MEYERS
Western Manager
Tribune Tower,
Phone Sup. 8329
Chicago

GRANVILLE M. FILLMORE
Eastern Manager
342 Madison Ave.,
Phone Murray Hill 6-3899
New York

ARMSTRONG



ARMSTRONG

Tool Holders, Turret Lathe and Screw Machine Tool, Lathe and Milling Dogs, "C" Clamps, Ratchet Drills, High Speed Steel Bits, Armide Cutters, Drop Forged Wrenches, Socket Wrenches, Drill Posts, Planer Jacks, Setting-Up Tool, Machine Shop Specialties

ARMSTRONG BROS.

Dies and Stocks, Pipe Cutters and Wheels, Pipe Vises, Pipe Wrenches and Tongs, Receding Threaders and Chasers

"Produce More"

has changed to

"Produce Profitably"

It is no longer enough to produce more. Limited markets require close working and careful watching of costs. Today's successful men and plants are those who will not tolerate waste. With modern methods and equipment they are finding profits in what others call "overhead".

Efficient tool rooms and machine shops standardize on Armstrong Tool Holders and "Save All Forging, 70% Grinding and 90% High Speed Steel" on all operations, on every lathe, planer, slotter and shaper. They avoid delays, for under the Armstrong System they are permanently tooled up. They tie up no money in stocks of costly tool steels nor in cumbersome bar tools, for each Armstrong Tool Holder is a multi-purpose tool that equals a complete set of forged tools, that take high speed steel cutters of standard shapes—that can be picked up any time, anywhere. There is no waste in heavy tool "stumps"—in an Armstrong Tool Holder each cutter can be used down to the last ounce. They have learned that the right Armstrong Tool Holder will invariably cut cutting-cost, can be picked up when needed from the nearest supply house, that it will be a strong, efficient tool and fit perfectly into their tool scheme.

Buy ARMSTRONG TOOLS from your Supply House

Write for Catalog B-35

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

328 N. Francisco Ave., CHICAGO, U. S. A.

New York San Francisco London

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

MODERN Machine Shop

CINCINNATI, OHIO VOL. 9, NO. 1

JUNE, 1936

The Making of Glassware Moulds

The production of moulds for glass manufacturing is a task in which high grade workmanship is combined with first-class equipment.

BY HOWARD CAMPBELL

GLASS is a remarkable substance, with certain remarkable qualities which peculiarly adapt it for an unlimited number of uses. The use of glass was restricted for many years, due to the fact that the manufacture of glass involved many trade secrets which were closely guarded, and thus was perpetuated as a manual task. In time, however, machinery was developed to take over some of the more common operations, and with the increase in production the price of glass began dropping toward a point which eventually placed it within the reach of manufacturers of all kinds of commodities.

Today glass is so common and the price is so low, comparatively speaking, that it is used for a wide variety of purposes. Not only is it used for

Fig. 1.—Machining the face of a section for a bottle mould.

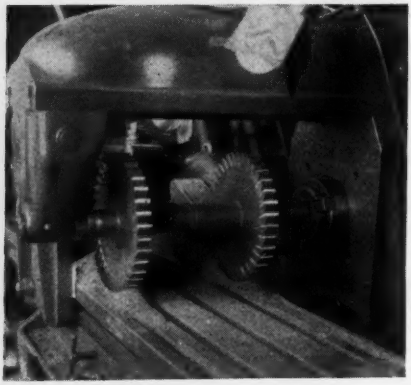


Fig. 2.—Face-milling the hinges so that the two halves can be joined.

making bottles and glass dishes and vessels, but it is also used for such objects as towel racks, lamp stands, different types and kinds of signs and displays, door knobs, and even glass "bricks" for the construction of sun rooms and other rooms where a maximum of light is desired.

In most cases, however, the glass is formed by moulding, or by blowing to the desired shape and contour in a mould. The moulds are usually of cast iron; thus the manufacture of glass presents a task for the machine shop. This article describes and illustrates some of the operations involved in the production of glass moulds, and is presented through the courtesy of The Toledo Mould Company, Toledo, Ohio — an independent mould-manufacturing plant which serves the glass industry at large.

The size, shape, and design of a glass bottle or other glass receptacle is dependent entirely upon the size, shape, and design of the cavity which comprises the interior of the mould. The molten glass is blown into the mould much in the manner of a huge bubble and thus shapes itself to the shape of the mould. The interior of the bottle, being filled with air, presents no problem; it is the outside with which the manufacturer — and we — are concerned.

In order that the interior of a bottle-mould may be properly machined, the mould is made in two halves which are hinged together. The first operation on one of the halves is that of facing the inside face, which is done on a shaper as shown in the illustration Fig. 1. The operation is of the common or garden variety, the picture being included more to show the shape of one of the halves of a mould than because of any unusual

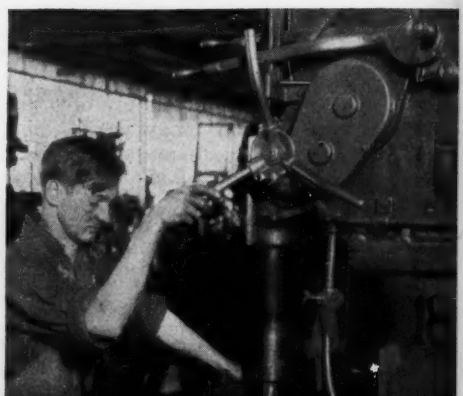


Fig. 3.—Reaming the hinge-pin holes.

element in the operation. On the left side of the piece can be seen the hinges by which this half and the other half of the mould are hinged together.

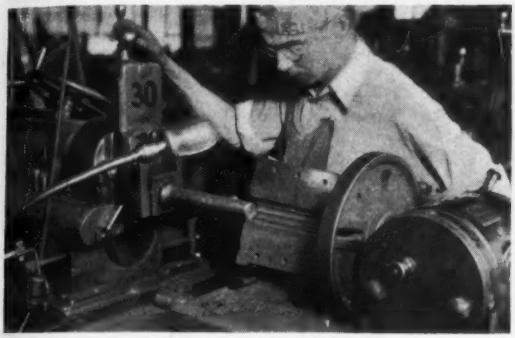


Fig. 4.—Shaping flutes in a mould for a glass lamp stand.

In order that the proper fit may be obtained on the hinges on the two halves of the mould, the hinges are faced on the Ohio miller shown in operation in Fig. 2. The hinges are faced to close dimensions so that the mould will close smoothly and easily, yet accurately. This is essential for the production of high grade glassware.

The next operation on the mould-half is that of drilling and reaming the hinge-holes, which is done on a heavy duty vertical drilling machine as shown in Fig. 3. Here the two halves of the mould are joined together and clamped as shown, and the top hinge is marked off for the drill. The holes are first drilled with a 1⅛-in. drill through the top hinge-pin hole and a 1-in. drill through the bottom hinge-pin hole, and then the holes are reamed with a taper reamer, the taper of which is ⅛ inch to the foot. The tapered hole provides for the use of a tapered hinge-pin which can be taken up as the holes wear and thus the hinges can always be kept tight. Both the drill and the reamer are of special length in order to reach through all four of the hinges. From here the two halves go to the machines upon which they are to be machined according to the design called for on the drawings.

The illustration Fig. 4 shows an interesting operation—that of shaping flutes in a mould for a glass lamp stand. The mould is clamped to the faceplate of the dividing head, as

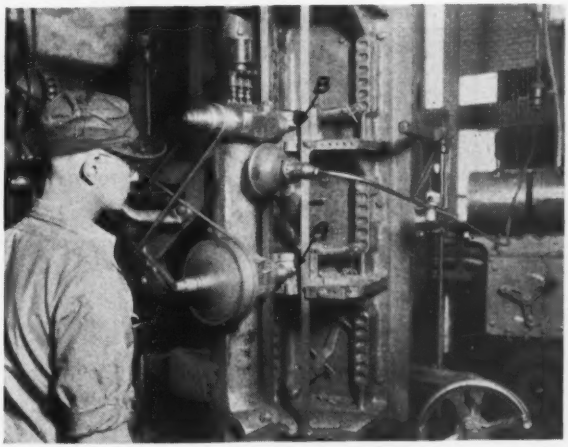


Fig. 5.—The Keller engraving machine makes it possible to reproduce any number of mould designs from a pattern, both accurately and quickly.

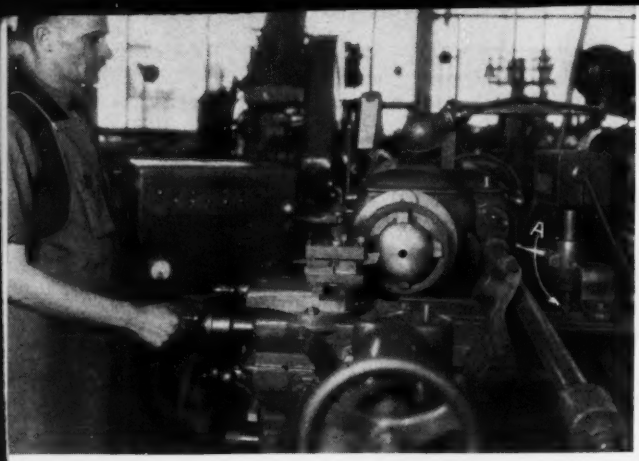


Fig. 6.—Machining a radius on a vacuum blank for a bottle mould. Here again an electrically-controlled tracer follows the contour of a pattern and makes it possible for this Monarch-Keller lathe to turn out accurate work in the minimum time.

shown, so that the flutes will be cut correctly, and the depth of the flute is obtained by feeding the tool down to a given point for all flutes. The tool is, of course, ground to the desired shape by the use of a gage. The toolbit is held in an extension toolpost so that the full length of the

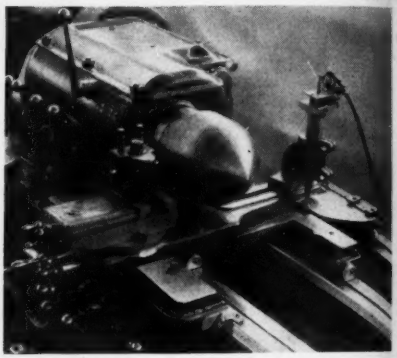


Fig. 7.—Close view of Monarch Lathe, showing how the tracer, in contact with the templet, controls the movement of the cutting tool.

flute can be cut without interference. This is just one of a wide variety of methods employed to produce the design in the mould.

Of more intricate design is the perfume bottle mould in process of being machined on the Keller engraving machine shown in Fig. 5. The mould is too small to be seen easily in the illustration, but the mould is located at A and the original pattern is located at B. A rather slender tracer is used which can follow every detail of the design, the cutting tool fol-

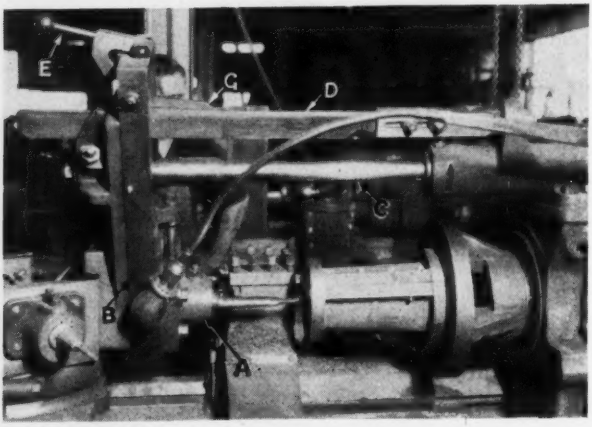


Fig. 8.—Boring a bottle mould, using a Warner & Swasey turret lathe with a special form-boring attachment.

PARTITION & PROTECT with ACORN

Wire Mesh Products

Partitions keep stock and tools safe. Standardized units insure ease of erection and low first cost.

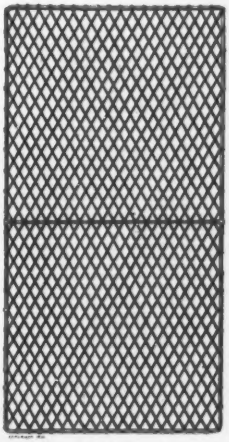
...THE most practical means of protecting supplies and equipment, guarding machinery, etc., building enclosures and partitions and solving many similar problems in every shop. Acorn wire mesh products are easy to install and to move . . are sanitary and attractive . . are fully fireproof and are amazingly low in cost.

Sani-Robe Coat and Hat Rack. Sanitary—Convenient—Economical.

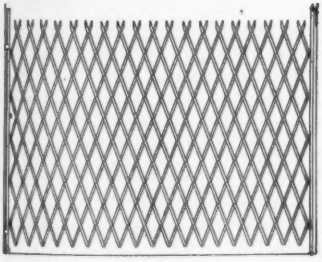
ACORN Products:

ENCLOSURES — for Stock Rooms, Tool Rooms, etc.
CAGES.
GUARDS — for Belts, Flywheels, etc.
FOLDING GATES.
WIRE MESH Elevator Enclosures.

Let us quote on your requirements. Write for 48 page catalog.



Wire Mesh Window Guards. Protect glass — Prevent theft.



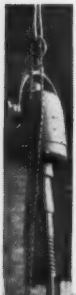
Folding Gates in doorways, etc., prevent trespassing. Many types to choose from.

Acorn Wire and Iron Works

5912-18 Lowe Ave. Chicago, U.S.A.

lowing the movements of the tracer and reproducing the design in the mould. With one carefully-made pattern and such a machine as this, any number of moulds can be made on a production basis, all of which will be exact duplicates of the pattern and of each other.

Another modern development in die and mould-making equipment is shown at work in Fig. 6. This machine is a Monarch lathe, equipped with Keller controls, and the operation is that of turning a radius on the nose of a vacuum blank for a bottle mould. The Monarch-Keller lathe is highly economical where duplicate parts are wanted, which is the case in this instance.



Turning a radius on a comparatively large section is a slow operation at best, and the only way semblance of accuracy can be obtained is by the use of a radius gage. And then the operator must cut and try in an effort to follow the curve of the gage. When the job is to be done on a Monarch-Keller, a templet is first made from sheet metal, the desired contour being marked off on the templet and then cut and filed to the exact shape required. The templet is then placed in position at the point A, where a tracer can be placed in contact with it. Once set, the machine is started and the carriage moves both longitudinally and crosswise so that the tracer can follow the contour of the pattern.

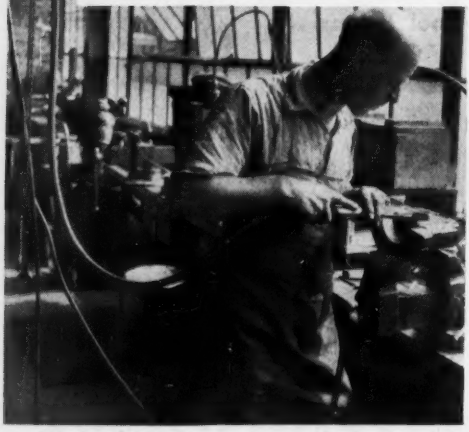


Fig. 9.—Polishing the interior surface of a bottle mould.

Fig. 10.—Putting the finishing touches on the lamp-stand mould.

Before the feed is engaged, the point of the cutting tool is set in position so that it will take a cut of the desired depth. As the tracer follows the shape of the templet, the cutting tool acts identically, cutting the shape of the templet on the work-piece. Thus it is only nec-

Hydraulic holddowns clamp sheets of any thickness securely and make possible machine tool accuracy in shearing. • These holddowns express the character of the Cincinnati All Steel Shear. • • • •

THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

essary for the operator to locate the work in the chuck, set the tool in position, and throw the feed in when ready; the machine does the rest—and does it accurately.

A closer view of the machine, Fig. 7, shows the templet in position and the tracer in contact with the templet. The cover has been removed from the electric control so that the mechanism can be seen. There is never more than five ounces of pressure between the tracer and the thin metal templet.

The operation of boring a bottle mould is shown in process in Fig. 8. Here the two halves of the mould are bolted together and clamped to the faceplate of a Warner & Swasey turret lathe. The boring tool is held in a toolholder A that is attached to a slide which moves vertically in the ways B. After the opening hole has been bored in the end of the mould, the boring tool is brought to position and the guide bar C and templet bar D are engaged as shown. The boring tool is inserted to the required length, then the lever E is raised, which raises the slide and engages the tool with the metal on the inside of the mould. As the tool feeds longitudinally toward the headstock, the vertical movement of the slide is controlled by the pattern G and the tool, being set at the top of the cut instead of the usual horizontal centerline, reproduces the shape of the pattern on the interior of the hole.

The final finishing operations on most of the moulds usually consist of hand operations. The mechanic shown at work in Fig. 9 is polishing the inner surface of the mould, for which he uses a polishing wheel made by wrapping a strip of abrasive cloth around a wood shaft. Power is supplied by a "U. S." flexible shaft unit, suspended from an overhead trolley so that it can be moved along the line of benches as required.

Figure 10 shows the lamp-stand mould again, in position to have the flutes finished by the use of a riffle file. The interesting feature of this job is the chuck, which consists of a half of a cast iron ball resting in a base of the same contour. The movable part of the chuck is heavy enough so that, even with a mould-section clamped to it, it will stay in any position in which it is placed, making it possible to locate the work-piece in any position best suited for the task. Such a chuck is an excellent piece of equipment for a tool, die, or mould shop.

The fine work involved in the operations described above is facilitated by modern equipment and a modern "day-light" plant. Additions are constantly being made to the equipment in order to reduce the manufacturing costs and improve the product. The Toledo Mould Company supplies moulds of the types described above to a large number of glass manufacturers, the specialty of this firm being moulds especially adapted to the machines which are in use in the customer's plant.

INFORMATIVE FOLDER FOR DROP-FORGINGS BUYERS. The Special Forgings Division of J. H. Williams & Co., 420 Vulcan St., Buffalo, N. Y., has issued an interesting and informative folder which will be welcomed by buyers and users of drop-forgings. Arranged in the form and shape of a standard letter-size filing folder, it contains much useful information including a table of weights of metals, die draft equivalents and practical data and explanation of accepted drop-forging practice.

With this reference information, in convenient form, draftsmen and designers will find help in laying out any drop-forged parts. Copies will be furnished without cost or obligation upon request.

Please mention MODERN MACHINE SHOP when writing to advertisers.

Give your turret lathe operator a break!

Help him do his work faster, more accurately . . . *and with much less effort*

GAIN all these shop advantages and recover present losses on your turning work.

Do you realize that new high speed Warner & Swasey turret lathes show an average increase in production of 30% over 1929 machines.

Find out exactly how much you can save on your present work with new Warner & Swasey turret lathes.

Our direct factory representative in your territory will gladly work with you. Remember, no savings are so easy as those made on machining operations. Write us today—we'll cooperate.

WARNER & SWASEY . *Turret Lathes* . Cleveland, Ohio

Modernizing the Tool Control System

No plant that is using an antiquated tool control system is really modern. This author tells how tools are handled at the government airport shops.

By Donald A. Clark

A COMPLETE record of each tool loan is provided by a tool checking system that is now in use in a number of plants. No one will ever be able to compute the value of the hours that have been wasted while high priced mechanics waited for the tool crib attendant to find their tool checks. No one will ever be able to estimate the value of the tools that have been lost to the companies to whom they rightfully belonged due to the inability of the tool crib attendant to keep their check records straight.

At last a tool control and record system has been developed which (a) provides all the information necessary about the tool and the borrower, (b) makes it necessary for the workmen to sign a receipt for the tool loaned, (c) provides two copies of the record so that it is possible to both keep a check on the locations of the tools loaned and on the tools borrowed by each mechanic, and (d) records all

Ohmer Tool Control Register. (A) Detail Record Spacer. (B) Operating Insert Key. (C) Master Key Control Lock. (D) Indication before operation. (E) Motor Bar. (H) Operating Handle.

this information with the pull of a lever.

The tool control system referred to, which is much simpler than it sounds and as effective as it is simple, has been developed by the Ohmer Register Company, Dayton, Ohio. No metal checks are used, the records being made on slips of paper which are issued from a register very similar in appearance and operation to a cash register. Originally adapted for this purpose in order to provide an effective method of controlling tool loans in the Ohmer Register Company's own plant, the efficiency of the method immediately became so apparent that calls for similar equipment began coming in from other manufacturers who had seen the Ohmer Tool Control Register in operation. Among the plants using the Ohmer Register are the machine

Waiting while the tool crib attendant searches for a lost tool check. The time and money wasted in this manner can soon reach a very sizeable figure.

shops at each of the U. S. Government airports.

It has always been the custom for the employer to supply such equipment as machine accessories and cutters as well as other equipment which, because of its nature, bulk, or weight, could not easily be transported. The mechanic, on the other hand, was expected to supply his own measuring tools and the other hand tools which comprised his personal kit. With the development of modern production methods, however, there has been a steady increase in the number of plants in which hammers, micrometers, punches, and other small tools are available at the tool crib windows.

Until very recently the most common method of recording the loan of tools was the "brass check" system. Under this system each mechanic was supplied with a set of metal discs—usually ten—bearing his clock number, one of which was exchanged for each tool borrowed at the tool crib. The check was hung on a hook at the point from which the tool was removed. Variations of this system have been used, none of which are fool-proof.

In the first place, it has largely been customary to use apprentice boys or workmen of the "common labor" type as tool crib attendants upon the assumption that the task required no considerable amount of skill or intelligence. This error has cost thousands of dollars in lost tools.

Secondly, it is a simple matter to hang a check on the wrong hook, or to be unable to identify the exact

The loan of each tool is recorded by two tickets issued from the Tool Register, one of which is signed by the borrower.

WAR DEPARTMENT - AIR CORPS
LOAN TICKET 6549
I CERTIFY I HAVE RECEIVED THE FOLLOWING

. . . . . .
Signature

DATE	UNIT	ROW	BIN	EMPL'E'S NO.	TICKET NO.
JAN 27	5	3	5 C	4365	3 6 0

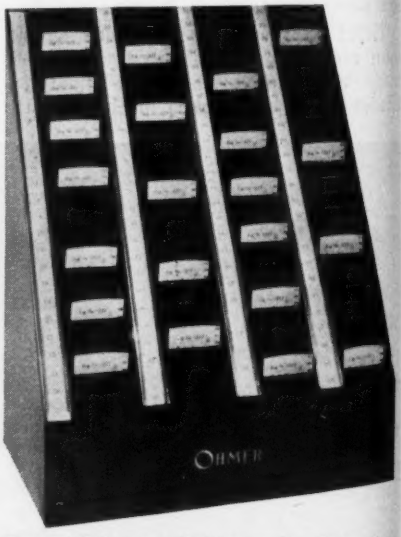
Tool Ticket, bearing date, employee's number, number of transaction, number of tool, and the numbers of the section and bin from which the tool was taken. A space is also supplied for the signature of the borrower. This form is from the type of register used by the Air Corps of the United States Government.

size and kind of tool for which the check was received, or to drop the check and lose it entirely, or to knock two or more checks off a hook and get them confused. In any of these cases the attendant has lost his record of the actual tool loaned and set up a situation that more likely than not will precipitate an argument which will cost the company money in the shape of lost time and will probably end in failure to regain the tool, to say nothing of unpleasantness and dissatisfaction all around.

Where the tool control register is used a complete record is obtained. As the tool is issued, the crib attendant sets the tool number, number indicating tool type, and employee's number on the register and then presses the motor bar, which causes the register to print and issue two original copies of the tool order form reproduced here. Each copy bears (1) the date, including the month, day, and year, (2) tool type resignation, (3) employee's check number, (4) tool number, (5) transaction number, and (6) register number. If desired, the number of the section and number of the bin from which the tool was taken can also be recorded on the ticket. This form is used at the several government airport machine shops.

As the mechanic is given the tool requested, a copy of the tool order is handed to him and he signs his name in the place designated. This copy of the order is then filed according to the employee's check number and is returned to him when he returns the tool to the crib. The other copy is filed according to the tool number.

Inasmuch as the employee signs for the tool received, the possibility of argument as to whether or not he received the tool is precluded. The workman knows that any tools receipted for by him and not returned to the crib will be charged against him, which has a salutary effect in



The tool tickets are filed by employee's number in this rack.

Another WELDON COST SAVER

WELDON TOOL HOLDERS AND ADAPTERS

Are

A big time and trouble saver, especially on larger machines. Holders are made in two sizes and adapters fit standard spindle tapers.

Holders quickly detach from adapters, cover all end- and shell-mill needs, save time on changes, and cost less than ordinary holder types.

Unsurpassed true running qualities.

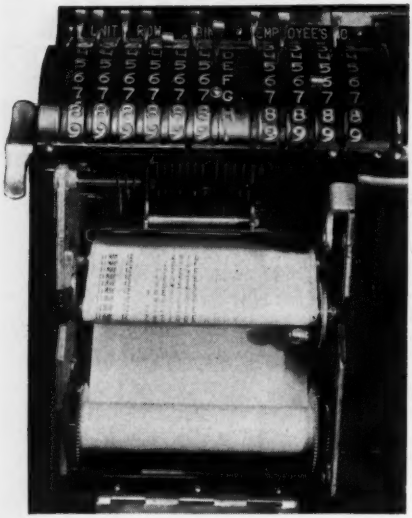
Write for descriptive folder.

THE WELDON TOOL CO.

321 FRANKFORT AVE. CLEVELAND, OHIO

"Pioneers in Fast Spiral Double-end End-Mills"

keeping tool losses at the minimum. He cannot successfully deny his own signature. In addition, the printed records provided by the register make it possible to trace tools immediately and thus minimize the amount of time consumed in obtaining or returning tools.



Each tool loan is automatically recorded on a sheet inside the register.

In addition to the two copies of the tool order which are filed in separate places as a record of the transaction, the same information is printed on a third record, which is locked into the register. This record is intended for possible future reference and is especially valuable in tracing tools. Although the possibility is remote, if both copies of the tool order should disappear, the record of the loan could be found on the permanent record in the machine and thus the tool could be located. The tool records may be—and usually are—destroyed upon the return of the tools to the crib, but the record of the transaction is permanent. In addition to the record of the loan, the transaction is numbered; thus the number of tools issued to employees over any given period of time is always available.

It is true that the system described here calls for a register and a card file, but the expense involved becomes an economy when the savings in time and tools are considered.

MILLING CUTTERS AND TRACERS FOR KELLER MACHINES. Users of Pratt & Whitney Keller Automatic Tool Room Machines will be interested in this 16-page catalog, now being issued by Pratt & Whitney Company, Hartford, Conn., describing and illustrating the various types and kinds of special cutters available for use with the Keller machines. The line includes spiral fluted cutters, cutters for profiling, taper cutters, straight fluted cutters, diamond point cutters, special cutters, cylindrical tracer points, tracer points for use with adapters, and taper tracer points. The P & W Keller Cutter Grinder for grinding Keller cutters and tracer points is also described and illustrated. Copy free upon request.

FURNAS DRUM CONTROLLER CATALOG No. 36. Included in this 12-page catalog, which is being issued by Furnas Electric Co., 1523 S. 77th St., West Allis, Wis., are descriptions and illustrations of a wide range of switches and controllers which are included among the products of this firm. Among the equipment presented are drums for reversible motors, drums for multi-speed motors, foot-operated switches for motor driven machines, reversing drum switches, reversing and two-speed drum switches, speed drum controllers for four-speed double winding induction motors, weatherproof and oilfilled drums for reversing and two-speed motors, and reversing two-speed drum controllers. Features of the controllers presented in this catalog are compactness, reliability, durability and accessibility. Copy free upon request.

Mention **MODERN MACHINE SHOP** when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

SOUTH BEND Precision LATHES
The Popular Priced Lathe
SOUTH BEND
The NEW 1936
30TH ANNIVERSARY
MODEL
For the Tool Room
In Countershaft Drive and Motor Drive types. 9"-11"-13" and 16" swing.
Write for new catalog and prices.
SOUTH BEND LATHE WORKS
977 E. Madison St.,
South Bend, Ind., U. S. A.
Lathe shown is No. 1892-G; 16" swing by 6' bed.

Methods Engineering Procedure: Engineering For Quality

In this, the eighth article of the series, the author points out that methods engineering not only reduces the processing time, but invariably improves the quality of the product.

By H. B. Maynard
President, Methods Engineering Council, Inc., Pittsburgh, Pa.

ONE of the vital problems which faces modern industry is the necessity for constantly improving the quality of the products which it manufactures. To enjoy a ready market, a product must not only sell for a price which is competitive, but it must satisfy the quality requirements of a consuming public which is daily becoming more exacting. Hence in order to remain in a good competitive position, manufacturers must definitely try to improve quality while at the same time reducing manufacturing costs.

This is a problem which at first glance would seem difficult enough to tax the ingenuity of even the best managements, but a way has been found of solving it through the application of methods engineering principles. Methods engineering, as a rule, is generally undertaken primarily for the purpose of effecting cost reductions, but the fact that an important by-product is usually obtained at the same time; namely, an improvement in the quality of the product, is beginning to gain recognition from those manufacturers who have conducted intensive methods study programs. It is the purpose of this article to point out the factors which lead to quality improvement and to discuss some of the older fallacies in the perennial quality vs. high production discussions.

Causes of Poor Quality

Whenever a piece of work of poor quality is produced, there is a definite reason for it. To function satisfactorily, a given part must be made to conform to certain definite standards. Right at this point occurs one of the chief reasons for poor quality work; the job requirements are either not definitely set up by management, or, if they are, the man who does the work is not fully instructed with regard to them. Hence the operator goes about the job with only a hazy understanding of what is expected, and the result is quite likely to be a product of inferior quality.

The extent of ignorance on the part of both supervisors and workers as to how work should be done is greater than is generally realized. One of

Get A Copy

of

This New Booklet

Make Your Chasers Last Longer

Don't throw your dull chasers into the scrap box. Use a Geometric Style E Grinding Fixture to resharpen them. Chasers frequently sharpened, chasers uniformly sharpened, chasers accurately sharpened — as they are with the use of this Fixture — will give you many times the threading life.

SEND FOR BOOKLET

THE GEOMETRIC TOOL CO.
3 VALLEY ST.
NEW HAVEN, CONN.

Specialists in production Threading Tools for Forty Years.

THE GEOMETRIC TOOL CO.
3 Valley St.
New Haven, Conn.

I want to know how to make my chasers last longer. Please send new booklet to:

Name..... Title.....

Company .....

Address .....

first points that methods engineering procedure emphasizes is the necessity of determining quality requirements at the beginning of the study. Dimensions, tolerances, finishes, and the like are investigated, and an attempt is made to become familiar with the requirements of the work so that it may intelligently be studied. In plants where the matter of inspection requirements has been standardized and reduced to writing, a clear cut statement of quality requirements will be obtained; otherwise it is difficult to get a straight-forward answer.

One will be told that the worker is supposed to do a good job, or that the drawing tolerances are closer than necessary so that more leeway is allowable, or vice versa, or that such and such a high grade finish should be maintained but that if it isn't certain customers are not particular so that it doesn't matter anyway, or conflicting statements will be obtained if the designer, the foreman, and the inspector are questioned. The list of hazy requirement situations which are encountered could be extended indefinitely, but the few given, all taken from cases which have come to the writer's attention within the last three months, are sufficient to illustrate one reason why uniform quality is not secured.

In order to obtain smooth, economical production, even where quantities are fairly small, all conditions must be standardized as much as possible. The methods engineer does not consider that standardization has been reached until each part is delivered to the operation in exactly the same condition as every other part and until the operator can do his work on the job by following a set procedure and a definite and fixed sequence of motions. The use of tolerances and common sense places this within the realm of the practical.

Accordingly, when the methods engineer discovers a job on which definite standards have not been established, he immediately takes steps to have the condition remedied. He obtains a definite statement, usually in writing, of inspection requirements from the one who is responsible for them, checks them for sufficiency in the light of his own manufacturing experience, and then sees that the worker receives an explanation of the requirements which have been established. All this is necessary if he is to be able to carry out the balance of his study properly. He acts at this point as an agency for standardization and operator training, and the quality of the work is improved by his efforts.

Proper Motion Sequence is Important

Another important cause of poor quality is the use of improper methods, which may either be intentional or due to ignorance of what constitutes the correct method. In the average shop where modern methods studies have not been undertaken, if five different operators are performing the same operation, one is likely to find that five different methods are being employed. It is not likely that the five methods are equally effective with respect to quality any more than they are equally good from the standpoint of time. Usually there is one method which results in the best quality, and this more often than not proves also to be the quickest.

The methods engineer during his motion study of a job considers in great detail each motion made by the operator. If the job is sufficiently repetitive to justify it, he breaks down the job into its basic divisions of accomplishment and studies each one separately. His primary purpose is to reduce the time required to do the job by eliminating unnecessary or

A REAL MONEY SAVER for EVERY SHOP

DALRAE SPEEDMILL

a user reports:

"It paid for itself in two months"

BECAUSE—The End Mills—"Milled".
BECAUSE—Dalrae Speeds Deliver Curled Chips.
BECAUSE—Keyways Were Milled to Jo-Block Fits at Faster and Safer Feeds Than Before.
BECAUSE—Correct Speeds Do Not Break End Mills.

6 SPEEDS---350 TO 4000 R. P. M.

Increase the usefulness of your milling machines with a DALRAE SPEEDMILL today. It pays for itself quickly.

Catalog on request.

Chicago Representative:
Walter F. Stegner
565 W. Washington Blvd.

Detroit Representative:
Walter S. Ryan Co.
Royal Oak, Mich.

THE DALRAE TOOLS COMPANY

SYRACUSE BLDG. SYRACUSE, N. Y.

The Cincinnati

HIGH SPEED CUT-OFF MACHINE

FOR SAFE, SPEEDY LOW COST CUTTING

of steel alloys, non-ferrous and fibrous materials of all kinds in various sizes, angles, and shapes up to 3¼" inclusive. Machine is built to carry abrasive wheel 12" or 14" diameter by $\frac{3}{32}$" or ⅛" thick operating at a peripheral speed of approximately 16,000 S.F.M. Straight or angle cutting vise as required.

Send for Bulletin giving complete description of this machine.

THE CINCINNATI ELECTRICAL TOOL CO.

Division of The R. K. LeBlond Machine Tool Co.

CINCINNATI, OHIO, U. S. A.

BUILDERS OF

The Cincinnati

Ball Bearing Electric Drills, Screw Drivers, Nut Setters, Tappers, Valve Grinders, Aerial Grinders, Tool Post Grinders, Floor Buffers, Bench and Floor Grinders.

inefficient basic divisions of accomplishment, but most of these also are of the type which have an effect on quality.

"Position", for example, is a basic operation which consumes considerable time. It is often characterized by a small hesitation as the fingers or arm of the operator endeavor to bring one object into an exact relation with another object. The success of the operation depends upon the degree of control which the operator is able to exert over his motions, and since the human element enters in, inaccuracies which will affect quality are almost certain to occur.

When the methods engineer discovers a positioning operation, he endeavors to reduce it in length by providing stops or guides which will enable the operator to bring the part into position with a relatively uncontrolled motion. Where this is practical, the time for performing the positioning operation is reduced on the average in the proportion of eight to one, and—equally important,—the quality of the job is improved since the opportunities for error on the part of the operator are greatly reduced.

To illustrate this by a simple example; a certain hole in a light part is to be burred by bringing it up against a large drill in a single spindle drill press. When no stops and guides are provided, the piece is transported to the drill, positioned under it, and then drilled. If the positioning is accurately done, a good job results. If the part is not centered accurately, the drill point tends to center it but may not do so entirely if the pressure exerted by the operator is light. If the position is unduly inaccurate, the drill point will strike the surface surrounding the hole and nick, scratch, or otherwise mar it.

On the other hand, if an angular guide is set up in such a position that

"Maxi" tools show marked superiority on abrasive or stringy materials, low carbon steel, cast and malleable iron. Try them.

Greenfield OPENS PLANT IN *Detroit*

Purchases J. M. Carpenter Tap and Die Company to service manufacturers in Middle West

"Greenfield" announces the acquisition of a complete, modern plant in Detroit which has been fully equipped and staffed with trained tool designers and engineers to give Middle Western manufacturers the most rapid service ever available on "special" taps of all kinds.

Full stocks of all standard *"Greenfield"* tools will also be carried at this Detroit plant to fill emergency orders, so whatever your needs, they can be satisfied completely, and *quickly*.

You may count on highest quality tools; a skilled advisory and engineering service, and speedy delivery when you send your orders for "special" taps to the new Detroit plant.

THE DETROIT ADDRESS
2102 West Fort Street
Telephone LAfayette 0411

GREENFIELD TAP & DIE CORPORATION
Greenfield, Mass.
New York Chicago Detroit

Maxi (They're Black) *Tools*

GREENFIELD

pushing the part against the two inner sides of the guide positions it so that the hole is directly under the drill point, the part can be transported to the guide with a relatively uncontrolled motion, positioning is practically eliminated, and a job of perfect quality is secured.

Similarly the elimination of other inefficient basic divisions of accomplishment tends to improve quality. "Search" and "select" are time consuming, and poor quality may result if a wrong selection is made. "Hold" is even more time consuming, and since the hand is a poor, weak, and inaccurate holding device, poor quality work may be expected. In countless instances, a quicker and better job has been obtained by providing a vise or fixture to do the holding. When one hand works and the other is idle, the idle hand can do unnecessary things which affect quality. All of these undesirable factors the methods engineer seeks to eliminate or improve.

When the methods engineer has studied and improved a job, motion by motion, he knows to the last detail how the job is to be done. He generally makes the workplace layout so that it can only be done by the method he has devised, and then carefully instructs the operator either verbally, by means of written instructions in the form shown by Figure 1 or by means of motion pictures. When this has been done, there is a reasonable certainty that the proper method will be followed with a minimum of additional supervision and hence that a job of satisfactory quality will be produced consistently.

Skill and Quality

From the methods engineer's viewpoint, skill may be defined as proficiency at following a given method. Skill is due partly to natural ability

LEITZ

PROFILE CONTROL PROJECTOR

This instrument lends itself to checking of small tools, fittings, screws, gears, etc. The accuracy of the measurements fulfills the most exacting requirements. The equipment has many exclusive features which make it a Universal Precision Instrument of the greatest versatility.

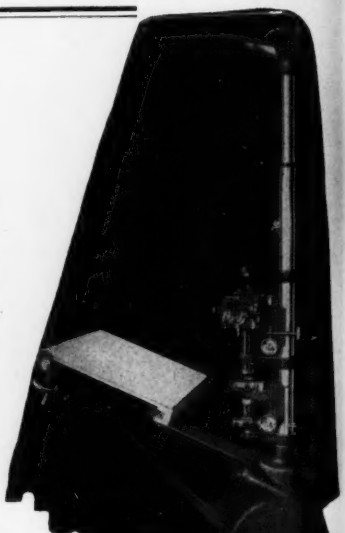
Catalog No. 7229 Will Be Forwarded Upon Request

E. LEITZ, INC.

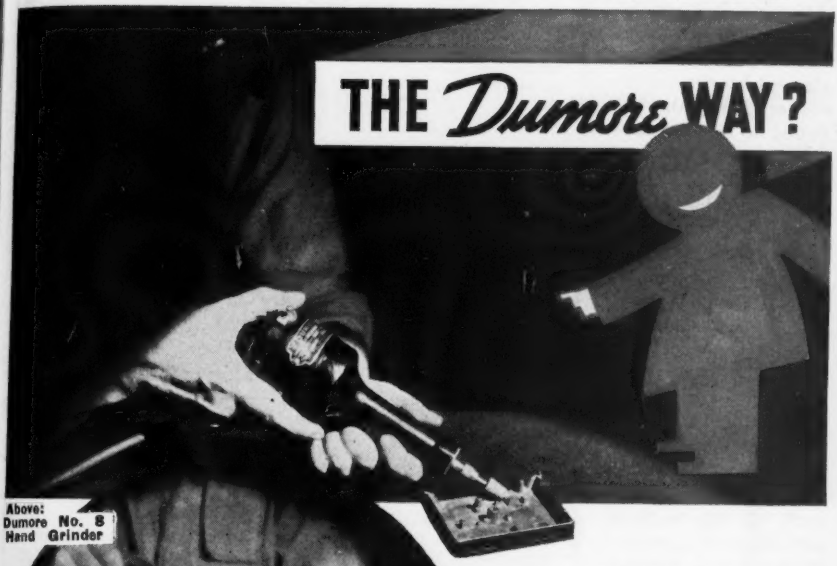
60 East 10th St. New York City

BRANCHES

Washington, D. C. San Francisco, Calif.
Chicago, Illinois Los Angeles, Calif.



HAVE YOU TRIED HAND GRINDING THE *Dumore* WAY?



Above: Dumore No. 8 Hand Grinder

Dumore No. 9 Hand Grinder

Any of your hundreds of off-hand grinding jobs, to be done quickly—and properly—should be done with specially designed tools. Of course you need high speed . . . and plenty of power. But more than that, the tool should be **FREE FROM VIBRATION** . . . should run cool in continuous operation . . . and give satisfactory service. You can expect all this and more in any Dumore Grinder you may select.

Dumore Precision Built Motors (A. C. or D. C.) are dynamically balanced for smoothness . . . armature windings are pre-expanded to prevent centrifugal "breathing" . . . armatures are mounted on double-shielded ball-bearings . . . and the whole unit force-ventilated and sealed against dust. Mail the coupon for complete information on the Dumore line of hand grinders—or ask any Dumore Industrial Distributor for **FREE** demonstration.

ASK YOUR DISTRIBUTOR FOR A *Free* DEMONSTRATION

The Dumore Company,
Dept. 186F, Racine, Wis.
Please send me the Dumore Hand Grinder catalog.

Name .....

Address .....

City ..... State .....

DUMORE
HIGH SPEED PRECISION
GRINDERS

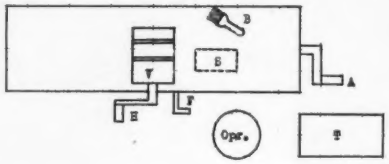
and partly to learning by experience or practice. When a job requiring say 50 rather difficult motions has been studied by the methods engineer and reduced to 25 comparatively simple motions, the job is not only easier to learn, but because the lesser number of motions are repeated more frequently during the course of a day, the operator develops his skill more quickly because of the fact that he has greater opportunity for practice.

A lengthy discussion of the various problems of operator training is beyond the scope of this article, but sufficient has been said to show that the training problem is simplified by the introduction of methods studies, first, because the proper methods are known to those responsible for training and, second, because the proper methods are invariably simple methods. Hence the training period is materially shortened, and the amount of poor quality work which is produced during the learning period is lessened.

INSTRUCTION SHEET

DATE 1 10 36 DWG. NO. 80231
OPERATION Mill Slot in Brass Clamp MACH. NO. 1208

FEED 6"/ min. Use cutter T-811
SPEED 140 rpm NOTE: Place supply of
TOLERANCES = 005 castings at S while
machine is cutting.

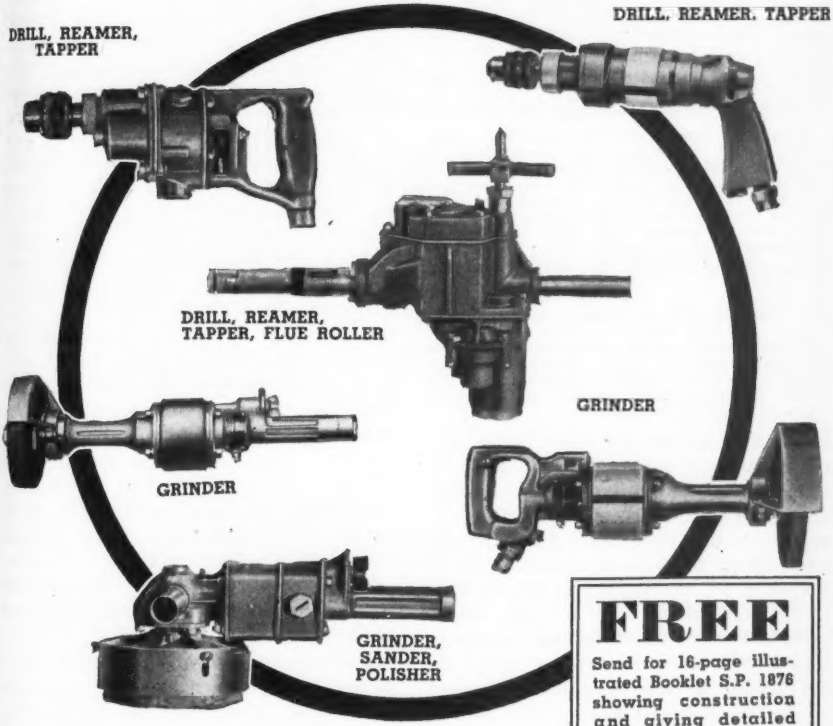


LEFT HAND	RIGHT HAND
	Move to part at S
	Grasp part
	Move to vise V
Idle	Position part in vise
Tighten vise	Hold part in position
Release vise handle H	Release part
Move to clutch lever	Move to table feed handle
Grasp clutch lever	Grasp handle A
Start machine	Idle
Idle	
Move to feed lever F	
Grasp feed lever	
	Run table forward 4"
Engage feed	Idle
Release feed lever	Release handle A
Mill slot	Mill slot
Grasp clutch lever	
Stop machine	
Release clutch lever	
Wait for machine to stop	Idle and wait for machine to stop
	Grasp table feed handle A
	Return table 5.5"
Idle	Release handle
Move to vise handle	
Grasp vise handle	Idle
	Move to part
Open vise	Grasp part
	Move part aside to T
	Release part
	Move to brush B
	Grasp brush
	Move to vise
	Brush out chips
	Move brush aside
Idle	Release brush

Fig. 1.—Instruction Sheet for Milling Machine Operation

"POWER VANE" ROTARY TOOLS

GREATER POWER · LESS WEIGHT
LOWER MAINTENANCE



FREE

Send for 16-page illustrated Booklet S.P. 1876 showing construction and giving detailed specifications of all types and sizes of "POWER VANE" TOOLS

Chicago Pneumatic Tool Company

General Offices: 6 EAST 44th STREET, NEW YORK, N. Y.

Birmingham, Ala.	Cleveland, Ohio	Dallas, Texas	St. Louis, Mo.
Boston, Mass.	Denver, Colo.	Los Angeles, Cal.	Salt Lake City, Utah
Chicago, Ill.	Detroit, Mich.	Philadelphia, Pa.	San Francisco, Cal.
Cincinnati, Ohio	El Paso, Texas	Pittsburgh, Pa.	Seattle, Wash.

CHICAGO PNEUMATIC

P-36-1

Greater Production and Higher Quality

The foregoing strikes at the heart of the quality problem and shows how quality is improved by the study of details. To those who have followed this series of articles it should be clear that job improvements come first from the elimination of unnecessary work and second from the efficient performance of necessary work rather than from quality-destroying speed and short cuts. It will be worthwhile to review the definition of methods engineering, considering it from the standpoint of quality.

Methods engineering is the technique which subjects each operation of a given piece of work to close analysis in order that every unnecessary operation may be eliminated and in order to approach the quickest and best method of performing each necessary operation; also, it includes the standardization of equipment, methods, and working conditions; frequently it includes the training of the operator or the transmission of skill; when all this has been done—and not before—it determines by accurate measurement the number of standard hours in which an operator working with standard performance can do the job; finally, it usually, although not necessarily, devises a plan for compensating labor which encourages the operator to attain or surpass standard performance.

First of all there is the elimination of all unnecessary operations. Provided the work really is unnecessary, this does not affect quality. For example, at one time the glass windows used in automobile doors were highly polished on all edges. It was eventually recognized that for the edges which fit into the retaining channels and which are never seen after installation, a smooth surface instead of a polished surface is all that is necessary. Consequently some unnecessary polishing was eliminated. This, of course, reduced the work required to produce a window without in any way affecting quality.

Necessary work should be performed as efficiently as possible. This involves detailed methods study as explained above. Fixtures are provided which make the correct performance of the work easier and more certain. Quick acting clamps, faster locating means, multiple cutters, and so on are recommended. Frequently a complete methods study leads to the tightening of machining tolerances so that subsequent fitting is eliminated. Such things either do not affect quality at all or improve it.

Occasionally the present method is discarded altogether, and a better way of obtaining the same results is devised. For example, the coils which are used in large turbo generators are made up of a number of turns of heavy strap copper. These are formed on a bending machine into the shape of rectangles some 30 or 40 feet in perimeter. The last three turns of each coil have to be about ⅛-inch narrower than the other turns for reasons connected with insulation. Formerly it was the practice to remove ⅛-inch of metal from the last three turns by hand filing, the equivalent of filing a strip of copper 120 feet long for each large coil. Thousands of hours were consumed on this work in the department making the coils. The operation was eventually eliminated by making the last three turns from narrower strap copper and joining them onto the heavier turns of the coil by a single brazed joint. Many examples of this sort could be cited.

Improvements of the kind mentioned bring about large production increases. They do this by making the job easier rather than by driving the worker to produce more at the expense of quality.

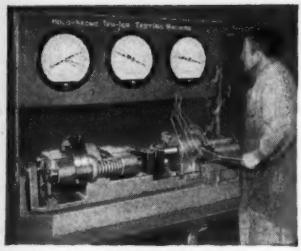
Methods Engineering is not a speeding up process. Indeed this is an exceedingly poor way to attempt to increase production. Reference to the performance-rating table given in the article "Methods Engineering Proced-

Anticipating Tomorrow's Needs in Today's Production

HOLO-KROME

TEN-TOR *Tested*

(TENSILE) (TORQUE)



FIBRO FORGED

TRADE MARK

Socket Screws

Now—TEN-TOR Tested

To you TEN-TOR means furnishing Holo-Krome FIBRO FORGED Screws in the proper proportions of every necessary Physical Property.

What is TEN-TOR?

The Holo-Krome TEN-TOR is a specially built, precision Testing Machine for accurately determining the various physical properties (Tensile-Torque-Yield Point-Elongation-Reduction of Area, etc.) of Holo-Krome Socket Screws under the identical conditions in which they are used in industry.—TEN-TOR is positive in its check of every batch of Holo-Krome atmospherically controlled heat treated screws.—TEN-TOR actually breaks the tested Screws to determine the maximum ultimate strengths. Proven Quality.—

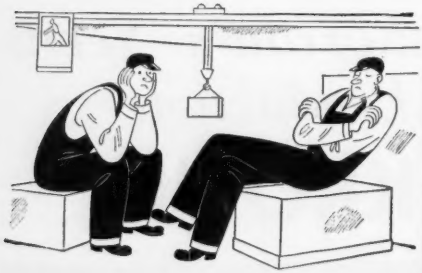
Distributors of Holo-Krome Products stock TEN-TOR Tested FIBRO FORGED Screws.

GET THE COMPLETE STORY. WRITE DEPT. "H."

HOLO-KROME SCREW CORP.

BRISTOL, CONN., U. S. A.

FIBRO FORGED TRADE MARK SCREWS



DILLYDALLY METHODS WASTE MONEY

WHEN production machinery's delayed, time wastes mount high on your cost sheets. Don't blame machine tool operators who have to wait frequently for crane service. Install Zip-Lifts for fast "spot handling"—let skilled machinists lift their own loads on and off machines — increase production — cut costs. The Zip-Lift is the new, light hoist that's faster, easier to install—and costs so little that it makes old hand-operated equipment obsolete.

Write today for new folder on "Spot Handling."

HARNISCHFEGER CORPORATION
ESTABLISHED 1884
4535 W. National Ave. Milwaukee, Wis.

ZIP-LIFT
STOPS WASTE
WITH "SPOT HANDLING"

ure: Time Study" which appeared in the January issue of **Modern Machine Shop** will show that the difference between the average effort and excessive effort, which can not be maintained for any length of time, is only 1 per cent. Hence the production increase which can be obtained by "speeding up" operators is so small as to be almost negligible in proportion to the gains which come from work-simplification and correct working methods.

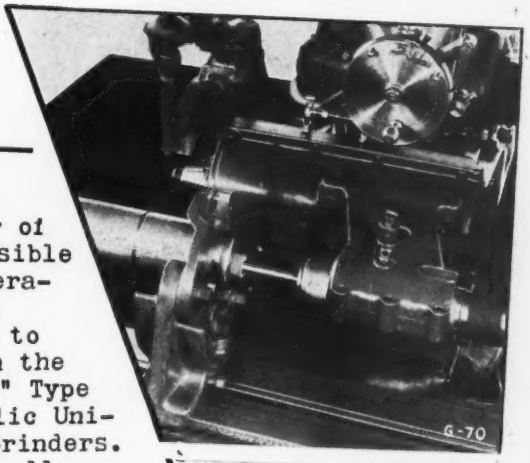
Incentives and Quality

Methods studies may be made with beneficial results whether incentives are used or not. Correct working methods are as important under day work as under incentive plans.

When better methods are devised as the result of detailed study and are taught to the operators, the chief ends to be attained are first to make it worth the operator's while to follow the improved method since it is the quickest, and second to insure steady application to the work with a minimum of unnecessary delays. However, since incentives are often used with or without careful methods studies, it will be well to consider briefly the effect of incentives on quality.

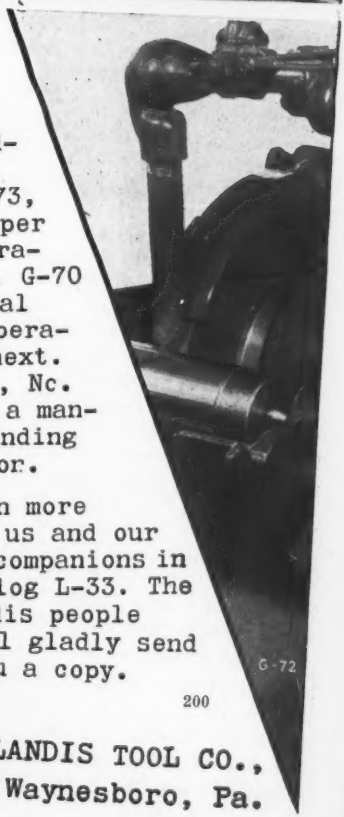
It is significant that shop men—those who are in the best position to know the relation between incentives and quality—seldom if ever speak of an unfavorable effect of incentive plans. Rather, just the opposite. Statements to the effect that incentives lower quality almost invariably come either from the general public or from those members of the industrial world who are not in close contact with the shop such as higher executives, salesmen, and design engineers. This fact, which anyone can verify, is enough in itself to indicate that there is little actual basis for the fear that incentives will affect

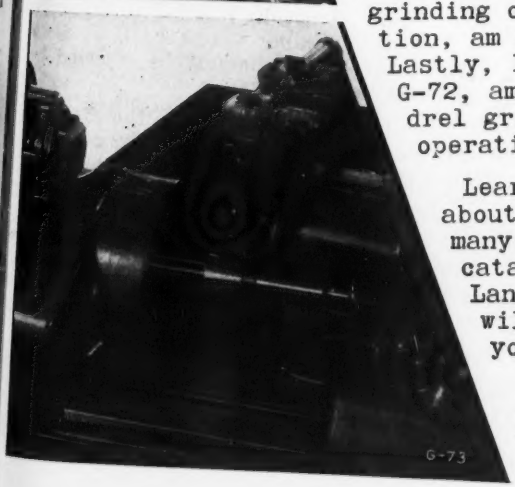
We are four—



We are four of the many possible grinding operations it is profitable to perform on the Landis 14" Type C Hydraulic Universal Grinders. Individually we will identify ourselves.

I, Nc. G-69, am a face grinding operation. And I, No. G-73, am a steep taper grinding operation. I, Nc. G-70 —an internal grinding operation, am next. Lastly, I, Nc. G-72, am a mandrel grinding operation.





Learn more about us and our many companions in catalog L-33. The Landis people will gladly send you a copy.

200

LANDIS TOOL CO., Waynesboro, Pa.

quality adversely.

At the same time, analysis will show that this feeling on the part of the uninformed is entirely understandable. Those who know little about a subject, lacking other basis, form opinions by judging the reactions of others by their own. A man who is not a craftsman, and hence who has no pride in doing a particular job well, is quite likely to think that all men who do that job take no interest in it either. He himself feels that his only interest would be in the pay envelope, and that he would cut every possible corner to increase his earnings. He therefore judges that other men will do likewise and will sacrifice quality to gain an increase in quantity. Hence, his honest but unsound pronouncements.

On new and experimental work or on certain classes of tools where quality standards can not be established with exactitude by the design engineers, the work is placed in the hands of highly skilled artisans. Such men take a real pride in doing good work, and it would be difficult to induce them to slight their job. Time standards on such work serve the purpose chiefly of keeping the men working steadily. If a standard is set too low, the worker will first do the job and do it properly, and will then attempt to convince the methods engineer that an error has been made. If one is set unreasonably high, he is quite likely to tell the methods engineer about it. Relations between this type of worker and the methods engineer are friendly and frank; they realize each other's problems and cooperate with one another.

Less skilled workers doing repetitive work do not as a rule have the pride and interest in their work that the highly skilled men have. Quite often they are indifferent to it, if they do not actively dislike it. The chances for them to do poor work, however, and have it approved are very small if the quality requirements for each operation are clearly established. An inspector checks all finished work. The parts either meet the inspection requirements and are passed, or they do not and are rejected. There is therefore little that the worker on such jobs can do to affect quality.

There are those who will turn out a poor piece of work and give as the reason that not enough time was allowed to do the job right. If such complaints come to the attention of one unfamiliar with time study methods and shop conditions, the impression is likely to be given that quality is lowered by incentives. As a matter of fact, a reason of this nature can only be advanced as an excuse by the worker to cover up a lack of skill or effort upon his part. Time standards are set only after a careful check of quality requirements has been made, and sufficient time for doing the job properly is always allowed. If the worker possesses average ability and works with an average effort, he will do the job within the allowed time. If not, he will fail to meet the time allowance unless he does work which will ultimately be rejected by the inspector.

In the final analysis, therefore, it seems illogical to connect quality too closely with incentives. It is unlikely that a man who would slight his job when working under an incentive system would be any more conscientious on a day work basis. A man who does good work will do it under any system, and a man who is careless or lazy will invariably be as careless and lazy as conditions permit him to be. Since day workers are usually less closely supervised than incentive workers, one is led to the conclusion

Tool Room or Heat Treating Department

IN either the tool room or the heat treating department a "ROCKWELL" Hardness Tester is essential if you are to make tools and dies that stand up in service.

In addition to that, however, you will find that lathe and milling machine production is not always a matter of the cutting tool. For example, if you machine alloy or tool steel, you will find that annealing or specifying the mills annealing to a determined "ROCKWELL" Hardness is an important production factor.

WILSON
MECHANICAL INSTRUMENT CO., INC.

Concord Ave. and 143rd St. New York

that incentive plans, if they affect quality at all, tend to raise it.

This conclusion, which is the result of logical reasoning, is borne out by actual experience. An amusing incident which illustrates how readily those who are unfamiliar with the workings of incentive set-ups can be led astray by their personal prejudices occurred in a large manufacturing organization. This plant was just beginning to get into the production of welded parts on a large scale. The engineering department was somewhat uncertain of the suitability of welding on certain classes of work, and they wished to do everything they could to insure perfect quality.

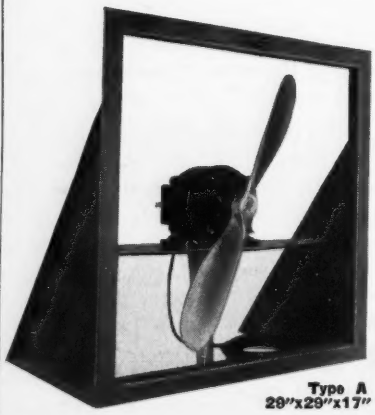
With this in mind, they strongly urged that no incentives should be applied to welding even though they were used successfully on all other classes of work. Welds, they pointed out, were difficult to inspect, and poor work could easily be covered up by a final carefully-applied layer of welding. Men on incentive woud be likely to turn out poor work in the desire to make high earnings, they thought, and they wished to avoid this danger.

So insistent were their demands that the works manager, in spite of the fact that there was no evidence of defective workmanship due to willful carelessness, finally agreed to send a special order through as a day work job to see what effect, if any, this would have on quality. Accordingly, an order of 10 welded pressure tanks was selected for the trial.

In due course the job was completed. Representatives of the engineering department examined the 10 tanks carefully and declared it to be a perfect job of welding. Their point was apparently proved until it was discovered that a slip-up had occurred. It had been agreed at the meeting that

NEW!! AIR BLAST FANS

Cool Workers Do Better Work.



Type A
29"x29"x17"

Delivers 5000 C.F.M.

Fans are equipped with SKF Ball Bearing Motors. Can operate in any position. High quality construction insures long life. Heavy wire guards $4.50 extra.

LOOK!!
At the Price

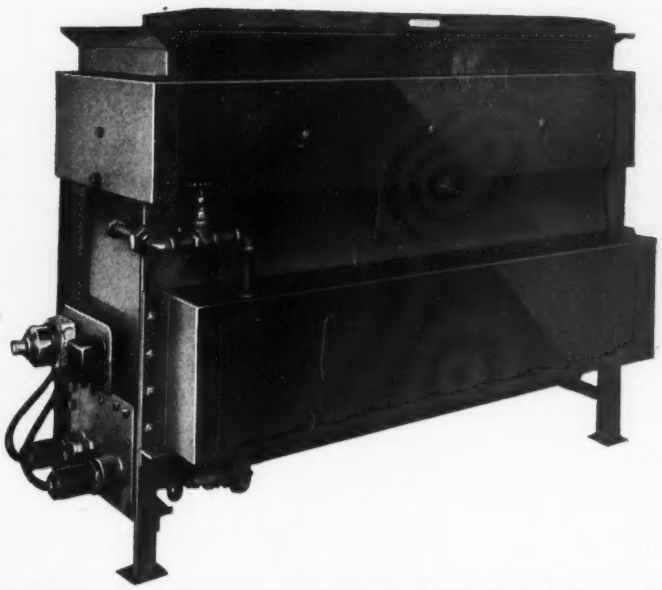
$29.60

110 V., A.C. F.O.B., N.Y.C.

Special introductory offer.

TWO WEEKS FREE TRIAL
Unconditionally guaranteed for 1 yr.

Chelsea Fan & Blower Co., Inc.
370 W. 15th St. New York, N. Y.



WHY A MANUFACTURER OF METAL OFFICE EQUIPMENT USES DETREX DEGREASING

A large manufacturer of metal office equipment gives the following reasons for operating a DETREX VH 400 Degreasing Machine on his production:

1—No fire hazard—Perm-A-Clor is non-inflammable

2—No oil or chemical residue left on the metal to bleed out after finishing

3—No oil seepage from seams

4—Cleaning costs reduced over previous method

5—Better finish possible

6—Elimination of rejects due to improper cleaning.

Ask for information on your cleaning problems.

DETROIT REX PRODUCTS CO.

Formerly Rex Products & Manufacturing Co.

13005 HILLVIEW AVENUE • DETROIT, MICHIGAN

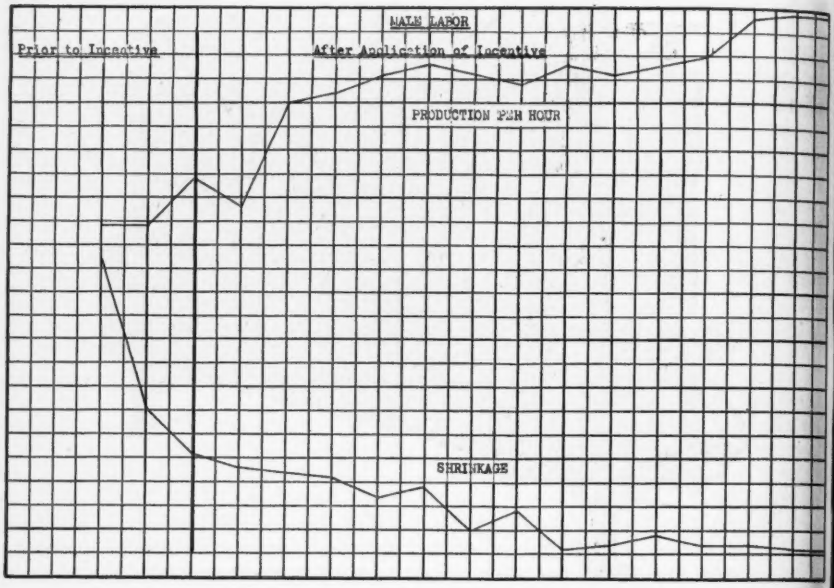


Fig. 2.—Curve showing decrease in shrinkage of scrap after installation of incentive

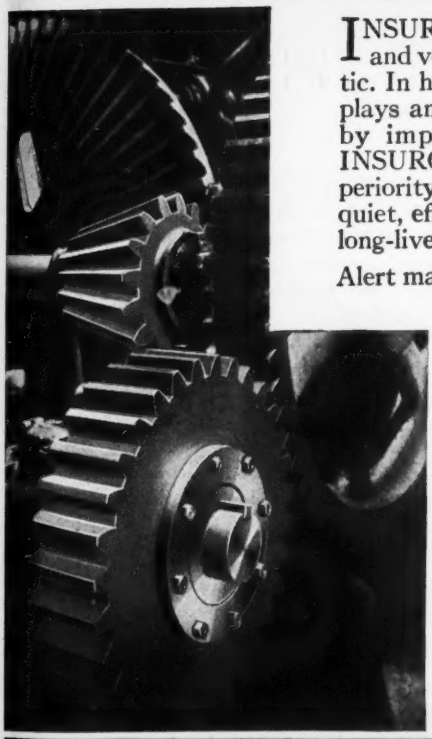
the job was to be done on day work, but no one thought to notify the time study department of this decision. As a result, when the job came along, it was time studied in the regular way, and followed the standard incentive routine in every respect. Since the engineering department had already declared the job perfect, there was nothing further to be said, and the welding has been done and done well on the incentive basis ever since.

Even more conclusive than the evidence of a single job are the figures compiled by one of the plants of the Pittsburgh Plate Glass Company on its entire line of work. Glass, of course, is a material which must be handled with care, for carelessness will result in scratches, breakage or other defects which lead to the scrapping of the work. When their incentive system was first installed, quality was therefore carefully checked, for excessive scrap could wipe out all of the benefits of the installation.

A composite curve of the total production of all male labor and the total percentage scrap produced before and after the installation is shown by Figure 2. Production rose steadily after the introduction of incentives and the amount of scrap fell off. The decrease in scrap was not necessarily due to the incentive system for methods and processes were improved as the work was studied. The curves do show, however, that there was no increase in scrap with the application of incentives, a fact which has been borne out by many other properly-made installations.

Mention MODERN MACHINE SHOP when writing to advertisers. Your cooperation will be appreciated both by the advertisers and this magazine.

Thousands of New Industrial Uses for INSUROK open profitable field for machine shops



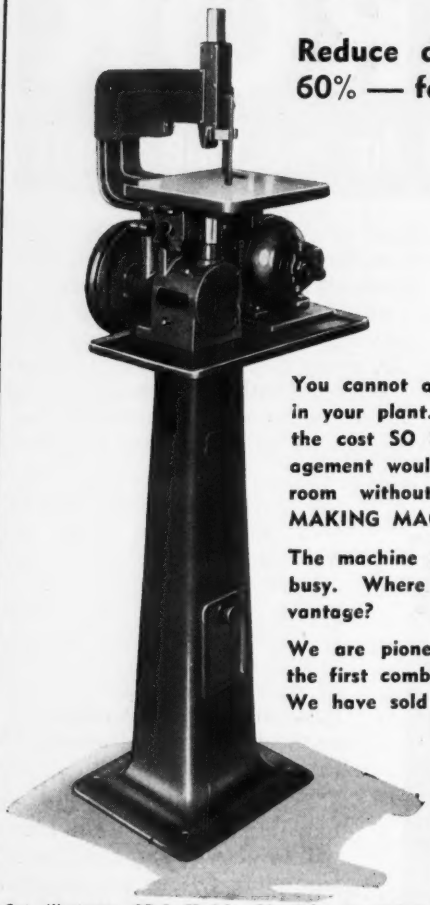
INSUROK is the most universally used and versatile laminated and molded plastic. In hundreds of manufacturing plants it plays an important part in reducing costs by improving production equipment. INSUROK every day demonstrates its superiority over all other materials where quiet, efficient, wear- and friction-resisting, long-lived pinions and gears are required.

Alert machine shops are quick to appreciate the additional advantages of INSUROK aside from its widespread use for gears, and to turn these advantages into profit. In your own shop INSUROK can be sawed, drilled, punched, tapped, turned, planed, milled, sheared and fabricated without difficulty, to meet other requirements of industry.

INSUROK will make money for you! Richardson technicians will be glad to show you how. Complete details on request.

The RICHARDSON COMPANY
FOUNDED 1858
Melrose Park, (Chicago) Ill. *Lockland, (Cincinnati) Ohio*
New Brunswick, N. J. *Indianapolis, Ind.*

OLIVER • of • ADRIAN
DIE MAKING MACHINES



Cut illustrates SP-2 Model. 10 styles to choose from for materials up to 3" thick.

Reduce die making costs 50 to 60% — fast and efficient on all sawing, filing and lapping operations.

● ● ● ●

You cannot afford to be without an "OLIVER" in your plant. The savings are SO GREAT and the cost SO SMALL. Only short sighted management would consider operating a die or tool room without an OLIVER of ADRIAN DIE MAKING MACHINE.

The machine pays for itself in 30 days if kept busy. Where could you invest to better advantage?

We are pioneers in this business, having built the first combination filing and sawing machine. We have sold many thousands in every part of the world.

Your competitors are taking advantage of the savings obtainable with an "OLIVER". Can you afford to be without it? Investigate today, send for literature and prices—no obligation.

OLIVER INSTRUMENT COMPANY
1430 E. MAUMEE ST. ADRIAN, MICHIGAN

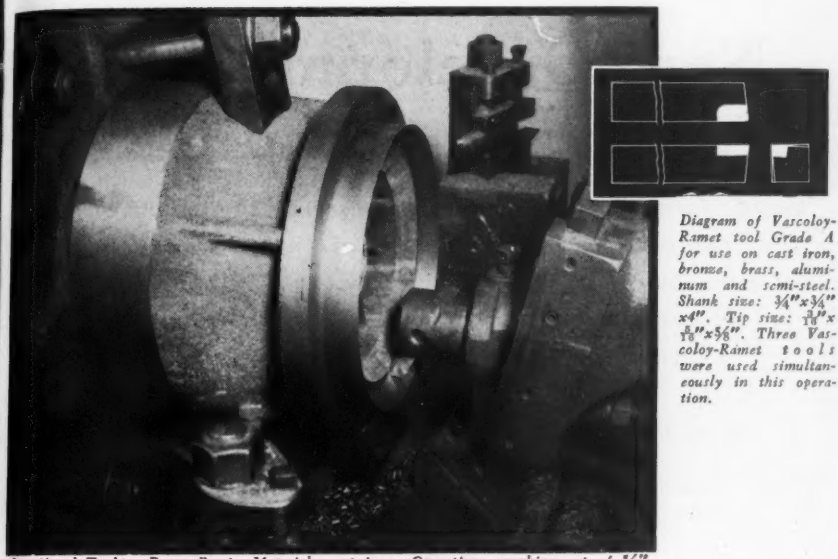


Diagram of Vascoloy-Ramet tool Grade A for use on cast iron, bronze, brass, aluminum and semi-steel. Shank size: ¾"x¾" x4". Tip size: $\frac{3}{16}$"x $\frac{5}{16}$"x$\frac{5}{16}$". Three Vascoloy-Ramet tools were used simultaneously in this operation.

Centrifugal Turbine Pump Bowl. Material: cast iron. Operation: roughing out of ⅜" on 45 degree angle seat,—O.D., 9⅛",—I.D., 6⅜", feed .018. Comparative performance of VASCOLOY-RAMET *tool:*

	Cutting Speed	Pieces Per Grind
VASCOLOY-RAMET	234 F. P. M.	150
Previous performance	75 F. P. M.	4 to 20

Again Vascoloy-Ramet, the new tantalum carbide tool material, proves its superiority!

The only hard cutting alloy with a grade for every machining need, Vascoloy-Ramet covers a wider range of uses than any other tool material.

Its strength, durability and fitness for each specific job are daily setting new high standards of economical performance on both routine and special orders.

Unrivalled in the machining of all steels, Vascoloy-Ramet stands alone as the only material capable of turning steel without "cratering." It also excels in performance on cast iron, semi-steel, and non-ferrous materials.

The new Vascoloy-Ramet catalogue price-list will be gladly sent upon request.

VANADIUM-ALLOYS STEEL CO.
Vascoloy-Ramet Division,
North Chicago, Ill.

VASCOLOY-RAMET

...The TANTALUM CARBIDE TOOL MATERIAL...

A GRADE FOR EVERY USE

District Sales Offices:

Pittsburgh .....Pa.
New York....N. Y.
Springfield....Mass.
Providence.....R. I.
Cleveland .....Ohio
Detroit .....Mich.
Chicago .....Ill.
St. Louis.....Mo.
Buffalo.....N. Y.
Newark.....N. J.
Knoxville ....Tenn.
Los Angeles Cal.
San Francisco, Cal.

New Developments in Thread Grinding

Threads, formerly considered to have served their purpose if they held two or more pieces together, are now required to hold those pieces together accurately. The production of accurate screw threads by the use of the modern thread grinder is discussed in this article.

By Ira J. Snader
Research Engineer, Machinery Division, Ex-Cell-O Aircraft & Tool Corp.

THE demands for greater accuracy and finer finish are rapidly spreading into every branch of the metal-working field. Until very recently, there were certain parts in various products covering a wide range in which the design and accuracy were considered of little importance. With the increase in competition and consequent effort to develop better products which has taken place within the past few years, the entire manufacturing picture has changed.

Farm machinery will serve as a good illustration of this point. Not so very long ago farm machinery was considered to be properly assembled if the bolt holes could be aligned sufficiently so that the bolts could be inserted through them and the nuts placed on the thread ends. Clearance was, of course, provided for the bolts in the holes and anything within the limits of this clearance was considered sufficiently accurate for the purpose. If the parts still refused to line up properly, they could be made to fit by a little filing here and there.

Measurements were designated in fractions of an inch. One reason why no effort was made to work to closer manufacturing limits was that it was felt that the ultimate owner of the machine would probably let it stand out in all kinds of weather and rust, anyhow, so why go to the additional expense of fine workmanship and precision manufacturing. Many other products, such as certain household appliances, were in a similar category.

The life of a mechanical product, however, depends very largely on the care with which it is built and, as the users learned to discriminate between the better products and those which were not so good, manufacturers began to take into consideration the requirements of performance, quiet operation, life of parts, and so on. Such consideration involved restrictions on manufacturing limits, finer workmanship, heat treatments of parts that were to be subjected to undue wear, and other elements of finer manufacturing. To a large extent the automobile industry has, during the past several decades, served as a laboratory for industry in general and a great number of the manufacturing processes which have been developed in the automobile industry

have been taken over by other industries in the metal-working field.

In keeping with this general trend, manufacturers of metal products covering a wide range have set up a demand for equipment with which finer precision can be attained and this demand is being met by American tool and machine manufacturers in a wholly satisfactory manner. Holes which a few years ago would have been considered accurate enough if they were reamed within 0.0005 or 0.00075 in. are today bored with a diamond or carbide tool to within perhaps 0.0002 in. Flat surfaces which a few years ago were considered accurate enough if surface ground within 0.001 in. are today lapped within perhaps 0.0002 in. Screw threads which a few years ago were considered sufficiently accurate if the screw shook but very lightly in the hole after being assembled today are in many instances only good enough if the thread is ground to a finish practically comparable to lapping and accurate within a tolerance of 0.0002 in. per inch on the lead tolerance.

The precision manufacturing of cylindrical parts and flat surfaces has been standard practice for many years; in fact, ever since the development of the cylindrical grinder. The finishing of screw threads by the use of the grinding machine, however, is a comparatively new development and one which deserves the consideration of every manufacturing executive who is concerned with precision manufacturing. Accordingly, presented herewith are several illustrations of one of the latest machines for the production of precision threads—the Ex-Cell-O Universal Thread Grinder. This machine will grind external threads on parts up to 8 in. diameter and to a length of 24 in. on work that is 33 in. long supported between centers. It will also grind internal threads from 1 in. diameter and 1 in. in length up to 8 in. diameter and 3 in. in length, maintaining a lead tolerance of 0.0002 in. per inch when grinding U. S. Standard form threads.

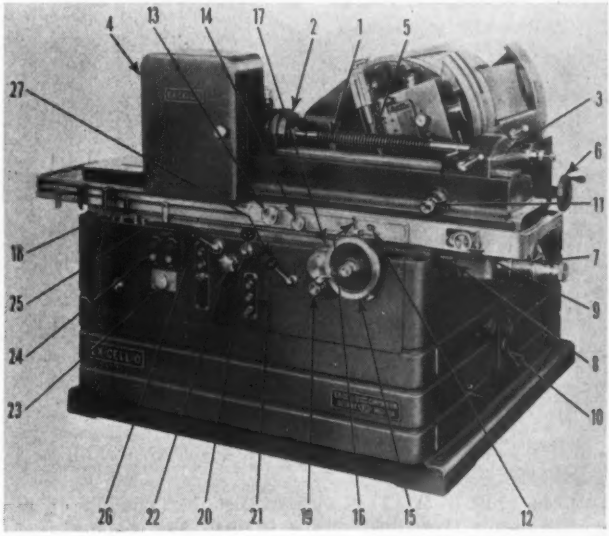


Fig. 1.—Ex-Cell-O Universal Thread Grinder

The machine shown is adaptable for grinding U. S. Standard form, sharp "V" threads, 29 degree Acme threads up to and including 60 degree thread form, and modified Buttress threads. Single threads, and with suitable indexing fixtures, double, triple, quad-

ruple, and sextuple threads within the range of pitches from 1 to 40 can be ground on this machine. It is automatic in all its grinding operations except for loading and unloading the work and withdrawing the wheel at the end of the cut.

The illustration Fig. 1 shows a front view of this new grinder with arrows indicating the outstanding features. The work (1) is inserted between centers, the work spindle (2) at one end and the tailstock (3) at the opposite end. The work spindle is driven by a hydraulic motor located in housing (4) which provides an unusually wide range of work speeds. Stepped pulleys on the hydraulic motor and the worm shaft that drive the work spindle also provide an additional range of speeds to accommodate grinding work pieces from ¼ in. to 8 in. in diameter.

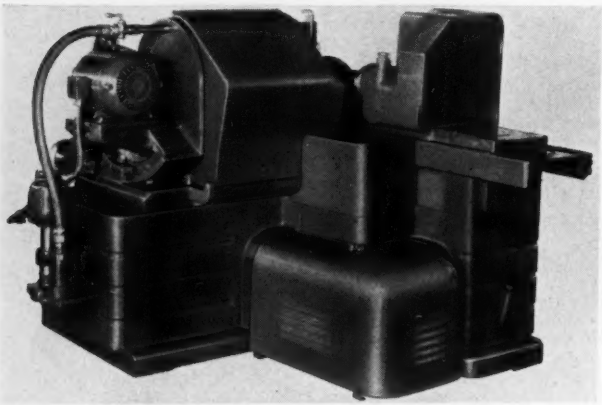


Fig. 2.—Rear View of Grinder with Guards In Position

The grinding wheel (5) is driven by a three horsepower, 220 volt, 60 cycle, three-phase motor through a "V" belt. Two wheel speeds are provided. The motor and wheel spindle are mounted in a swiveling cradle to permit tilting of the wheel 45 degrees from the vertical position to suit the helix angle of left-hand threads and 30 degrees to suit the helix angle of right hand threads. Hand wheel (6) rotates the cradle to the correct angular setting to grand the proper helix angle.

A hydraulic backlash compensating device (7) operates in conjunction with the lead screw shown at (8) making it possible to grind in either or both directions of the table travel. A work positioning knob (9) located in front at the right end of the work table permits matching the wheel with the thread on work which has been previously rough-threaded. A filter and gauge (10) is located at the right end of the base for supplying lubricant through a pump to the table and cross slide ways.

The upper part of the table is so constructed that it may be swiveled to grind tapers up to a maximum of 2 in. taper included angle in 12 in. length. The taper adjusting screw is shown at (11) and the lead compensator scale is shown at (12). Adjustment is made for correcting the lead error caused by the taper setting, by the hand knob (13) which can be locked in position by knob (14). The table taper adjustment and the lead compensating adjustment are graduated in inches taper per foot.

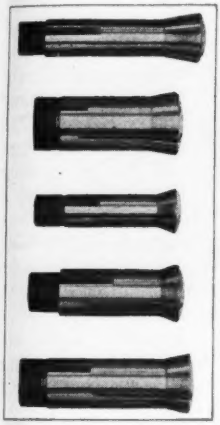
The machine will grind to a predetermined size setting and then automatically stop feeding or the machine will stop at either or both ends of its travel. A cross feed handwheel (15) with a pawl (16) for automatically

THIS COLLET DATA BULLETIN AVAILABLE

FOR

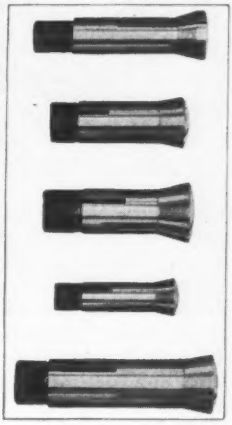
Purchasing, Stockroom and Engineering Departments

ALL TYPES



HARDINGE
COLLETS SINCE 1890
DRAW-IN COLLETS
FOR ALL
LATHES AND MILLERS
PROMPT DELIVERY FROM STOCK
FOR
– ACCURACY –
– DURABILITY –
– ATTRACTIVE PRICES –
"SPECIFY HARDINGE COLLETS"
Refer To Inside Pages For Your Requirements
Purchasing and Engineering Departments. Keep This List for Reference Purposes
Hardinge Collets are in stock for immediate delivery. Hardinge Collets embody those elements of precision which have characterized our products since 1890.
HARDINGE BROTHERS, INC., ELMIRA, NEW YORK

ALL SIZES



ASK FOR BULLETIN NO. 36A

Reasons Why Each Department Should Have a Copy:

1. **Clearly shows the styles of collets adapted in your lathes and millers.**
2. **Lists the standard collets with general dimensions for identification.**
3. **Gives normal round, hexagon and square capacity of standard collets.**
4. **Shows how all of your lathes and millers may be adapted for collets.**
5. **Collet stocks in Elmira, Chicago, Detroit, New York and Los Angeles.**
6. **Attractive prices are listed for round, hexagon and square hole sizes.**

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

SPECIFY HARDINGE COLLETS

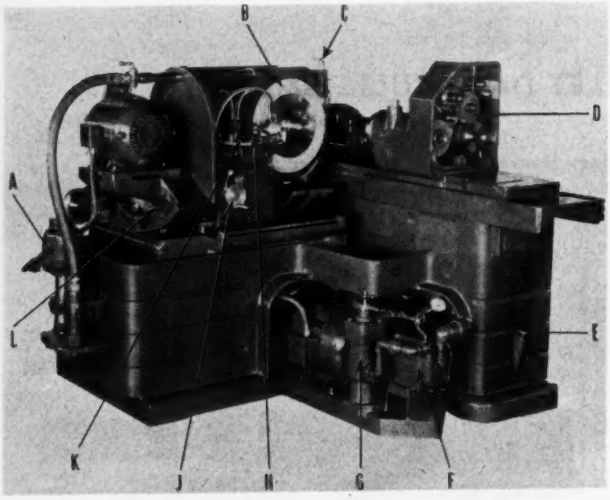


Fig. 3.—Rear View of Grinder with Guards Removed to Show Operating Parts

controlling the cross feed provides hand or automatic cross feed as desired. The cross slide adjustment is shown by a dial indicator (17). A reset knob (19) for the cross slide indicator is provided. Adjustable control dogs (18) are provided for controlling the direction of table travel and work speeds in either direction and an automatic stop.

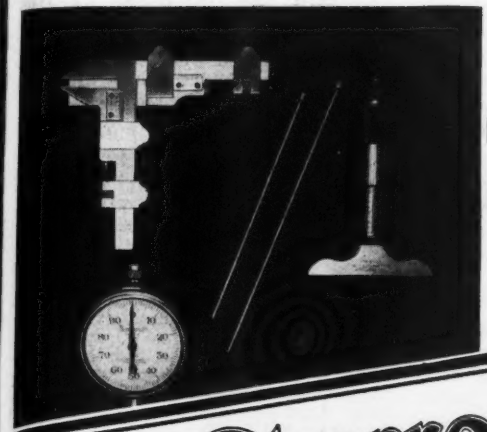
Manual controls for operating the machine are within easy reach of the operator. Lever (20) starts the machine table on its cycle and three hydraulic control knobs (21) control the rate of table travel. The top knob controls the speed to the left, the center knob rapid traverse in both directions and the bottom knob, the speed to the right. The hand knob (22) provides a manual table reverse. An emergency stop button (23) enables the operator to stop the entire machine when necessary. Above this stop button are the two push button switches (24) for starting and stopping the grinding wheel and hydraulic pump motors.

The machine is provided with a wheel trueing device that carries three dressing diamonds, hydraulically operated by hand knob (25) and hydraulically controlled by hand knobs (26). Hand lever (27) is the dresser slide control for advancing the dresser slide a predetermined fixed amount previous to dressing the wheel. A back-off attachment is available for this grinder to permit backing off straight or spiral fluted taps, either right or left hand.

Two rear views of the grinder are included, Fig. 2 showing the machine with guards in position and Fig. 3 with guards removed.

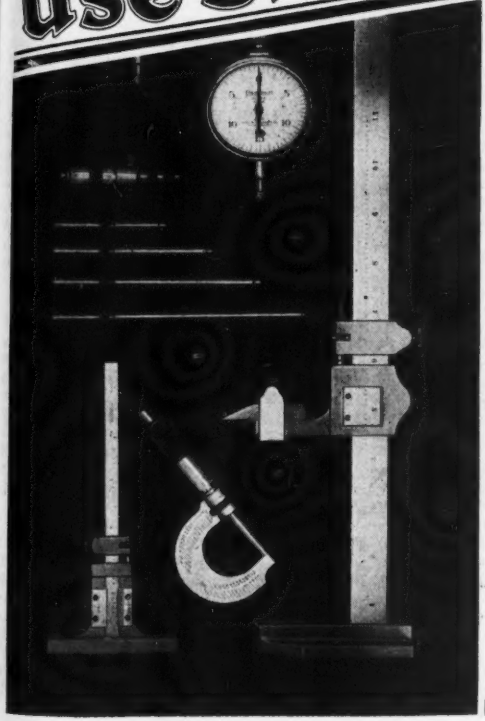
A vertical centrifugal pump (A, Fig. 3) furnishes the coolant oil to the grinding wheel from the reservoir in the base at the rear of the machine. It is on the same electrical circuit as the grinding wheel motor so it will operate whenever the grinding wheel is running. The pump and tank form an integral unit and are easily removed from the machine for cleaning. (B) shows the 18 in. diameter 5/16 in. thick grinding wheel with the coolant valve (C) for directing the coolant to the wheel and work.

This machine is designed to grind any pitch from one to forty per inch by means of change gears (D). Each machine is equipped for one specific pitch and additional gears are furnished as extra equipment.



FOR EVERY SHOP EQUIPMENT NEED

Use Starrett Tools



IT certainly pays to standardize on Starrett when you buy precision tools, dial indicators, or hacksaws. Your favorite distributor or mill supply house carries a complete stock so you always know just where to get what you want when you want it. And as every tool user and buyer knows, there's no better way to make sure of lasting accuracy and dependability than to insist on getting Starrett Tools. The new revised edition of Starrett Catalog No. 25 MD and the special Starrett Dial Indicator Catalog illustrate and describe the complete line of Starrett Tools.
May we send copies?

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
Athol, Mass., U. S. A.

BUY THROUGH YOUR DISTRIBUTOR

Pressure for the hydraulic system for controlling the machine is supplied by the hydraulic pump (F) driven by an electric motor. The oil passes through the filter (G) while circulating through the machine. The hydraulic oil reservoir is located in the front of the base and filled through (E).

The hydraulically-operated wheel dressers are located at (H). A manual control for advancing the wheel dressers is provided at (J) and the hand knob (K) operates the dressers hydraulically, while setting up the machine. The helix angle graduations (L) are located at the bottom of the cradle to indicate the proper helix angle setting for right or left-hand threads.

MODERN CUTTING FLUIDS. The complexity of modern machining operations due to new processes, new types of cutting tools, and a wide variation in metals and other materials, has complicated the lubrication factor in manufacturing and developed problems which have commanded the attention of lubrication engineers. The result has been that a considerable amount of research has taken place recently, involving the use of especially designed testing machines. "Modern Cutting Fluids", a booklet now available through D. A. Stuart & Co., 2729 S. Troy St., Chicago, Ill., analyzes these problems and presents the results of the tests for the benefit of the reader. Drawings and photographs are used to illustrate the action of the tool upon the work and of the cutting fluid upon the tool, and the booklet gives some interesting information concerning cutting lubricants. Copy free upon request.

NEW P & H HOIST BULLETIN. A new bulletin devoted to the construction, installation and operation of the "Zip-Lift" hoist has just been published by the Harnischfeger Corporation, Milwaukee, Wis. This new unit, an electric hoist offered in 250 and 500-pound capacities, is designed for faster "spot handling" in all types of production where light loads are repeatedly lifted or lowered. A copy of the bulletin may be had upon application to the Corporation's home office at Milwaukee or to any of its branch officers or agents.

BRISTOL THERMOMETER CATALOG No. 1250. A thermometer catalog, containing 88 pages of timely and useful information concerning the theory and practice of modern-day thermometery, has been published by The Bristol Company, Waterbury, Conn. This catalog, No. 1250, covers Liquid-Filled, Vapor-Tension, and Gas-Filled Recording, Indicating, and Controlling Thermometers. It also describes a new interesting Small-Bulb Gas-Filled Thermometer.

In connection with Automatic Temperature Controllers, it gives information regarding both the electric and pneumatic types, and helpful sketches to illustrate how they are applied. As an addition to this, application data are given on industrial stem thermometers, resistance thermometers, humidity measuring instruments, control valves, time-temperature controllers and the accessories that are used with thermometers on industrial applications. In order to enhance the value of the catalog as an engineering hand book, over 500 temperature recording charts, the most complete listing ever published, are illustrated in full size. This catalog, printed in the form of an engineering reference book, is free to users of recording and controlling thermometers upon request.

BCA BALL BEARINGS. This 38-page, 8½x11 in., wire bound book contains photographs, descriptions, and complete specifications for the line of BCA Ball Bearings made by Bearings Company of America, 505 Harrisburg Ave., Lancaster, Pa. The book also contains a fund of engineering data of prime interest to the user of ball bearings. Copy free upon request.

PALLET HANDLING EQUIPMENT. A wide range of lift trucks, barrel trucks, portable elevators, portable cranes, skid racks, barrel and drum racks and drain racks are illustrated and described in this 4-page folder, now being issued by Barrett-Cravens Company, 3255 West 30th St., Chicago, Ill. Applications of these different pieces of equipment are shown and specifications are included. Copy free upon request.

H & G INSERT CHASER DIE HEADS: The Easter Machine Screw Corporation, New Haven, Connecticut, has issued an eight-page bulletin entitled "H & G Insert Chaser Die Heads". It explains features of the H & G Die Head, which is often referred to as "Razor Blade Head" because of the small inserted chasers which can be thrown away when dull. Copy free on request.

EARN MORE FOR YOU!

You've a Right to Expect More Profitable Operation with Socony-Vacuum's Cutting Oil
REJECTS, frequent tool grinds, poor finishes . . . these have been greatly lessened by thousands of plants using Socony-Vacuum Cutting Oils. Superior quality and unvarying uniformity account for that.
The Socony-Vacuum representative is qualified to help your men boost the earning power of your machines. For he is backed up by years of practical experience in all types of cutting operations.

OIL COMPANY
ORATED
SION · LUBRITE DIVISION · WHITE EAGLE DIVISION
GENERAL PETROLEUM CORPORATION OF CALIFORNIA

GARGOYLE
Lubricants

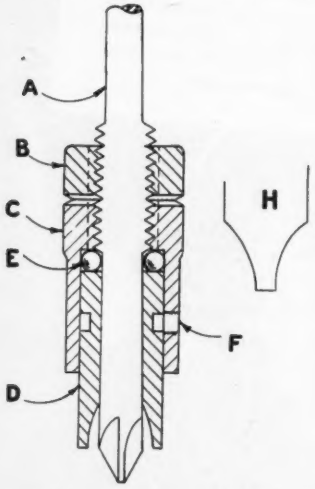
Ideas from Readers

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Ball Bearing Stop for Counterbore

By Frederick Wolf

THE cross section drawing herewith illustrates the design of an adjustable ball bearing stop, for use with a counterbore or countersink, that can be fed to the required depth without marring the face of the work.



Ball Bearing Stop for Use with Counterbore or Countersink

The part **A** is the shank of the tool and also carries the cutting edges. Economy can be achieved by making the cutter separate, with a hole through the center to fit the shank and a slot across the top to fit a corresponding tongue in the bottom end of the shank, as shown.

The part **B** is a hexagon locknut which is tapped to fit the thread on the shank. The nut, when screwed down against the part **C**, holds it firmly in place. Part **C** is the thrust sleeve, which serves both as a retainer for the rotating stop **D** and as a thrust for the balls **E**. The thrust sleeve is made with a hexagon at the upper end so that it can be adjusted with a wrench. the adjustment determining the depth to which the tool can be operated.

The ball bearing stop **D** is reamed or bored to a running fit on the shank, so that when the lower end of the stop strikes the work, it will remain stationary while the tool continues to revolve. It is counterbored at the lower end, as shown, and is also cut away as shown at **H** to allow for passage of chips. A groove is cut around the central part of the stop and is used to keep the stop in place in the sleeve. The screw should be of the headless type.

The use of this stop will make the counterbore or countersink independent of any stop on the machine, and the stop can be set for close accuracy. The thread should be of a fine pitch and all parts should be hardened and ground.

Hardening Hammer Handles

By C. F. Fitz

MOST mechanics find that after they have used their hammers for a long period of time, the handles

MARVEL TAPPERS

Low Priced Universal

Standardized Models

Write for Bulletin No. 500

Start with the bare machine (any bench model) and add accessories as you need them.

These are universal machines with standardized attachments — Horizontal machines that handle the wide range of work heretofore requiring far more complex and more costly equipment. Their smooth friction action prevents tap breakage. Slotted Sliding Table cuts fixture and jig costs to a minimum.

Seven models (sizes) identical in design, all motor driven.

Seven capacity ratings.

A complete line that handles efficiently all taps from fine thread No. 0 to ½" in steel.

Standardized Attachments

Any or all may be added, at any time.

1. **Rear Action Lever with Spring Return.**
2. **Front Action Lever with automatic depth trip.**
3. **Foot Treadle action with automatic depth trip.**
4. **Quick-change spindles for threading, tapping, nut or stud driving, etc.**
5. **Special 2-tap geared spindle for No. 0 to ¼" taps.**

MARVEL

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

345 N. Francisco Ave. Chicago, U. S. A.

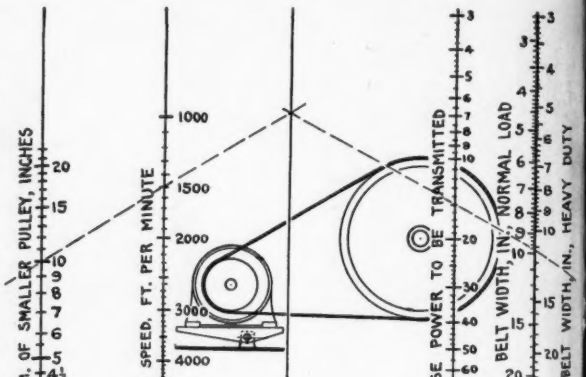
break under very little strain. This is due to the fact that the lumber from which the handles are made is kiln-dried—a process which removes all the moisture from the lumber. Kiln-drying makes the wood easier to work and prevents it from warping, and it is only natural that the longer a handle is used, the drier it becomes. Eventually it becomes very brittle.

To overcome this difficulty and make the handles last longer, the following procedure should be followed. Immediately after a handle has been fitted to a hammer, the hammer and handle should be put into a container with enough ordinary machine oil to completely cover it. It should be left in the oil for two weeks, then removed and the surplus oil cleaned from the handle, after which the handle should be given a coat of white shellac. The shellac seals the oil into the wood and the user will find that the handle will last much longer than it otherwise would. It will also be found easier on the hand, as the absorption of the oil gives the wood a resiliency which enables it to absorb the shock instead of transmitting the shock to the hand.

Belt Width Chart for Short Center Belt Drives

By W. F. Schaphorst

HERE is a chart which is intended to simplify the matter of determining the width of belt to use on a modern short center drive. This chart is based on the scientific fact that the diameter of the smaller pulley has much to do with the belt width required to transmit a given horsepower. In the old days we used the rule "A belt one inch wide will transmit one horsepower for each 800 ft. per min. belt velocity." Such a rule is inapplicable to the use of the modern short center drive.



Belt Width Chart for Short Center Drives

To find the correct width of a belt to use on a short center drive, run a straight line through the diameter of the small pulley as indicated in column A and the figure in column B which indicate the belt speed in feet per minute. Locate the intersection in column C. From that point of intersection run a second straight line through the horsepower to be transmitted, column D. The intersection of the line with column E will give the correct width of the belt that should be used.

The two dotted lines drawn across the chart show that where the smaller pulley has a diameter of 10 inches, the belt's speed is 1500 ft. per min.,

STAMINA!

In this new Duro-Brace Texsteel Sheave, for Texrope V-Belt Drives, an outstanding, modern design, combines with the finest materials and with manufacturing methods derived from vast experience, to give you a sheave that will withstand the severest duty. • The outside walls of this sheave are reinforced by convex steel plates which so greatly increase their strength as to eliminate distortion, even under extreme overloads; thus giving a light, true running drive always. • Duro-Brace Texsteel Drives are 98.9% efficient . . Require no lubrication or belt dressing . . . Are unaffected by moisture or dust . . . Are shock-absorbing, vibrationless, slipless, silent and clean. • Mail us a card asking for Bulletin No. 2188 which sets forth the advantages that Duro-Brace Texsteel Drives offer you in all matters of power transmission, whether they be simple or complex.

★ *New Duro-Brace Design: cross-section showing outside plate braced by a convex reinforcing steel plate.*

TEXROPE DIVISION

ALLIS • CHALMERS

MILWAUKEE WISCONSIN

HANDEE TOOL OF 1001 USES!

GRINDS
CARVES
POLISHES
ENGRAVES
DRILLS
SAWS

DeLuxe Model
$18.50 POSTPAID
6 Accessories FREE

● Unmatched performance—a sensation wherever used, in experimental laboratory, model and tool room, on the production line in large and small plants—making, shaping, polishing all metal products, alloys, glass, composition materials, wood, stone, etc.

Use this amazing tool for difficult precision jobs and hard-to-get-at places on intricate machine parts without removing the parts or dismantling machine. 200 different accessories available.

Fastest and most powerful tool for its type and weight ever developed. 25,000 r.p.m. Weight 12 ounces. Almost human in its smooth, rapid response. Try a Handee! Test for yourself its marvelous efficiency.

Order Today on 10 Days Trial or Send for Catalog

CHICAGO WHEEL & MFG. CO.
1101 W. MONROE ST., DEPT. 00
CHICAGO, ILL.

M. M. S. — 6
☐ Send Catalog
☐ Send De Luxe Handee on 10-Day Trial

*Name*_____

*Address*_____

*City*_____ *State*_____

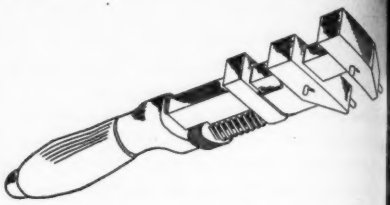
and 15 h.p. is to be transmitted, a belt 10 inches wide will be required if the load is normal. Column E shows that if it is a "heavy duty" load, the belt should be a little over 11 inches wide. Thus column E takes care of both normal loads and heavy duty loads.

Millwrights and belt men may be assured that the sizes indicated by this chart are correct for all practicable short center belt drives and for all pulley ratios up to 6 : 1, the belt being two-ply and of good quality. For longer center distances the margin of safety is even greater. The greater the center distance, the greater the safety factor.

Combination Monkey and Spanner Wrench

By C. F. Fitz

EVERY millwright and repairman will occasionally run across a job that requires the use of a pin spanner wrench, and just as often the



Combination Monkey and Spanner Wrench

wrench that was made for the job is missing. In order to eliminate the difficulties which arise from such a situation, pins were set into the jaws of a monkey wrench as shown in the drawing.

We drilled and tapped holes for $\frac{1}{8}$-inch 32-pitch thread, then made pins from drill rod and threaded them accordingly. The pins were made so that when screwed into the holes, they project $\frac{3}{16}$ inch from the

A NEW ADDITION TO A FAMOUS FAMILY

DESIGNED with characteristic Williams riginality, endowed with typical Williams periority . . . THE "SUPERECTOR". A w reversible ratchet wrench . . . rugged, pid, distinguished by many structural l utility features which make it outnding.

lliams' "SUPERECTOR" is built for fast eration in heavy and severe service and bodies such unique features as:—

1. Quadruple Pawls, instead of the usual 2, providing double bearing and strength with greatly increased durability; and

2. Drop-Forged Handle, not cast, in order to utilize the extra strength afforded by the pawls.

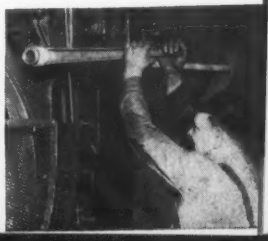
Other improvements and refinements make THE "SUPERECTOR" worthy of your immediate investigation. Ask your distributor or write for descriptive literature today.

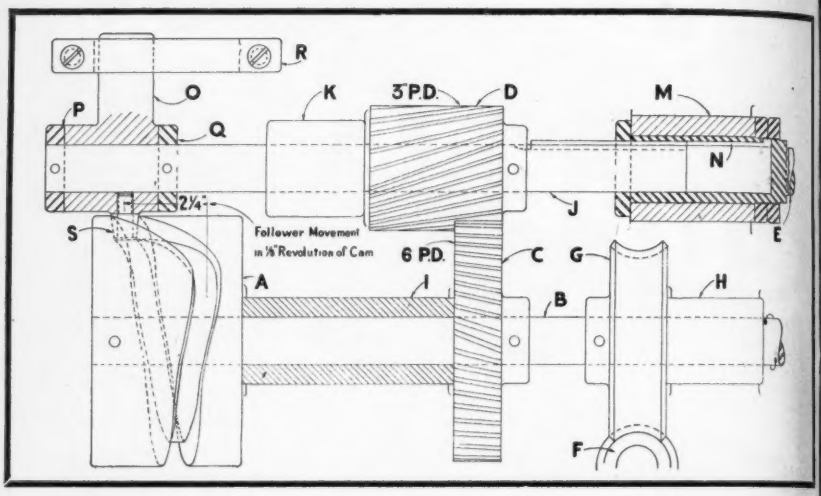
Williams' "SUPERECTOR" Wrenches are made in 5 sizes—24 to 48". Both Hex and Square Sockets, with hole extending clear thru, openings 1-1/16 to 4-5/8", operate nuts on any length of bolt. Deliveries June, excepting largest Wrench and all Square Sockets in July.

FULLY GUARANTEED

J. H. WILLIAMS & CO.

75 Spring St., New York





Drawing of Mechanism for Varying the Rotary Movement by Reciprocating a Helical Gear Axially

face of the jaws. Thus a spanner wrench is provided which will fit any job up to the capacity of the wrench, the required size being obtained by adjusting the jaw of the wrench in the usual manner.

Varying the Rotary Movement by Reciprocating a Helical Gear Axially

By J. E. Fenno

THE conveyor of an automatic lacquering machine has a varying surface speed; that is, a slow speed while the lacquering is being done and a fast speed to move each successive part rapidly into its lacquering position. A rather ingenious mechanism is employed for imparting this motion to the conveyor, one of its advantages being that it is positive, thus permitting perfect synchronization with the movements of the other members of the machine. This mechanism, shown in the illustration, consists essentially of a driving shaft F which through a worm gear and a cylindrical cam reciprocates a helical gear axially. Owing to its axial movement, this gear, meshing with its mating gear, varies the angular velocity of the driven shaft E, which drives the conveyor.

The driving shaft F has a worm engaging the worm gear G secured to the shaft B. This shaft is supported in bearings H and I and on it is pinned the cam A and the helical gear C. Gear C meshes with gear D pinned to the shaft J which slides axially and rotates in the bearing K, but, owing to the spline N, slides axially only in the sleeve of shaft E which is free to turn in the bearing M. At the left hand end of the shaft J is the arm O, the hub of which turns freely on the shaft but any axial movement relative to this shaft is prevented by the collars P and Q. Also, the arm cannot rotate as it is

ROSS

Operating Valves

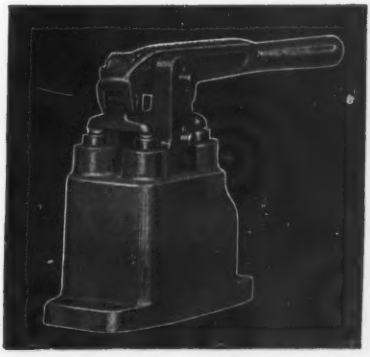
"The Bridle for Air Horsepower"

For controlling single and double acting air cylinders—wherever work is to be held in place or fed to machines—wherever pressure is to be applied — on chucks, vises, molding machines, welding, riveting and threading machines—Ross Operating Valves serve dependably, last long.

Send for this New Catalog

describing Ross Operating Valves controlled by hand, foot or solenoid. A booklet bulging with data on air cylinder control.

ROSS OPERATING VALVE CO.
6488 Epworth Blvd.
Detroit, Michigan



guided in the horizontal guides **R**, which are stationary. On the hub of the arm is mounted the follower roll **S**, which engages the endless groove in the cam **A**.

During the first ⅛ revolution of shaft **B** from the position shown, there are two movements of gear **D** and shaft **J** involved: first, a rotary movement resulting merely from the rotation of gear **C**; and second, the rotary movement imparted by the cam when it slides gear **D** axially. To determine the resultant movement each condition must be dealt with separately.

For the first condition, the rotary movement of gear **D** is in a counter-clockwise direction (looking at the right hand end of the machine) and is equal to the diameter of gear **C** ÷ diameter of gear **D** × revolutions of gear **C** or
$6/3 \times 1/8 = 1/4$ revolutions of gear **D**.

In order to determine the second movement, let us assume that the cam is free to turn on shaft **B** and that gear **C** is prevented from rotating. Now, rotating cam ⅛ revolution in the direction of the arrow will move gear **D** axially toward the right and at the same time in a clockwise direction. The actual rotary movement of gear **D** may be determined by plotting the diagram as shown in the following:

According to trigonometry,

The movement of gear **D** = Tan 22½ deg. × axial mov. of gear **D** = 0.932 in. Hence gear **D** rotates $\frac{0.932}{3\pi} = \frac{0.932}{9.425} = 1/10$ rev. (approx.).

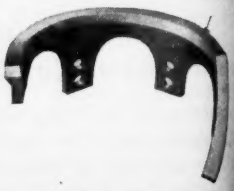
From the preceding, we find that the resultant rotary movement of gear **D**, while gear **C** is rotating ⅛ revolution corresponding to the 2½ in. follower movement, is the difference between the two movements involved or

ALLOY STEEL CAMS
FOR AUTOMATIC SCREW MACHINES

It will pay you well to check up on these MODERN Products. These and many other screw machine equipment items are described in our new catalog. Write for it.

Bullard Cams . . . of alloy steel . . . only the path of the roller is hardened about ⅛" deep, body is left soft. If cam has to be placed in new position on drum, holes can easily be drilled.

Cut Off and Form Cams . . . of special alloy steel . . . will absorb any shock, leads are milled accurately insuring longer life to cutting tools.



Lead Cams with alloy steel face for longer life and accuracy. A comparison of this type cam against other makes proves it is far advanced in principle and lower in price.

MODERN COLLET & MACHINE COMPANY
401 SALLIOTTE ST. ECORSE, MICH.

The Simonds Red Tang trade mark is used only on strictly first quality files.

Accurate in width, gauge and thickness for making dies, jigs, templates, etc.

For grinding the hardest steels and for all other machine shop purposes.

On extra tough work use Simonds Super-Cobalt Bits.

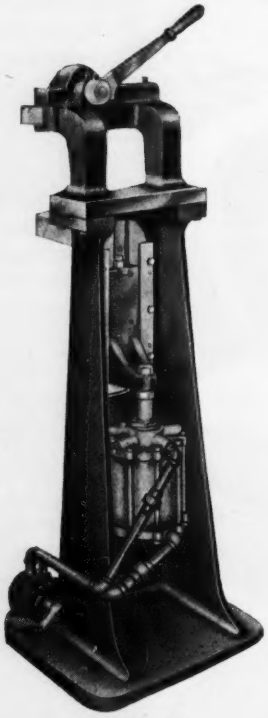
Circular and Band Saws—all sizes for sawing wood.

Ask Your Supply Dealer

SIMONDS SAW & STEEL CO., *Fitchburg, Mass*

MARKING

FLAT—ROUND IRREGULAR SURFACES BY ROLLING OPERATION



MODEL 25
HI-DUTY MARKING MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILL.

1/4 — 1/10 = 3/20 revolution in a clockwise direction.

To determine the resultant movement of gear D during the remaining ⅞ revolution of gear C, the same procedure and diagram just outlined may be followed. In this case the axial movement and helix angle of gear D of course remains unchanged. Therefore, the movement imparted to gear D by the cam is 1/10 revolution as given in the diagram; but in a counter-clockwise direction.

The rotary movement imparted to gear D by gear C is greater, however, and is equal to the diameter of gear C ÷ diameter of gear D × revolutions of gear C or

6/3 × 7/8 = 1¾ revolutions in a counter-clockwise direction.

Thus, the resultant movement of gear C will be

1¾ + 1/10 = 1 17/20 revolutions in a counter-clockwise direction.

It will be noted that the number of revolutions of gear D for each revolution of gear C is not altered by the cam movement since the number of revolutions of gear D is 3/20 + 1 17/20 = 2.

By modifying the cam throw, other variations in the rotary movement of shaft E may be obtained. An intermittent movement of this shaft can also be obtained if the throw of the cam is increased so that the corresponding movement on the pitch circle imparted to gear D is equal to that of gear C.

MONARCH CAM-LOCK FLANGED SPINDLE. A two-page catalog insert describing and illustrating the cam-lock flanged spindle and hardened cam-lock spindle nose which has been adopted as standard equipment on Monarch lathes has been issued by The Monarch Machine Tool Co., Sidney, Ohio. Copy free upon request.

Please mention MODERN MACHINE SHOP when writing to advertisers.

ers . . . . .

1 and No. 2 Universals

nes are ideal
om use. Var-
including a
to take either
oot or B & S
harpening of
cutters and
rical grinding
grinding and

ll hand oper-
the No. 2 is a
n can be ar-
nd operation
ydraulic table

**ither or both
uest. Write.**

NORTON COMPANY

WORCESTER, MASS.

NEW YORK CHICAGO DETROIT CLEVELAND
HARTFORD LONDON

M-356

Over the Editor's Desk

AMONG the stock phrases in current use in the Michigan community in which your editor was reared was one which seems to have especial significance these days: "Waste not—Want not." To make the phrase positive instead of negative; whatever is wasted today will be sadly needed sometime in the future. To one to whom such phrases were Gospel, the figures on the millions of dollars that have been paid to farmers during the past couple of years to destroy good food and good cotton are food for thought.

In this connection, some of the statements made by Dr. Glenn Frank, President of the University of Wisconsin, before the National Machine Tool Builders' Association last month were of unusual interest. Among other things, Dr. Frank said "In an age of real, genuine scarcity . . . . the poor will endure their lot without undue whimpering. But I do not believe that want will forever stay docile in the presence of plenty if that plenty is kept just beyond its reach by blind blundering in the field of political and economic policies. That is why the issue of an economics of plenty versus an economics of scarcity is more than an academic question for professors of economics to argue about. The whole social stability of America's future is at stake in the choice we as a people make between these alternatives . . . .

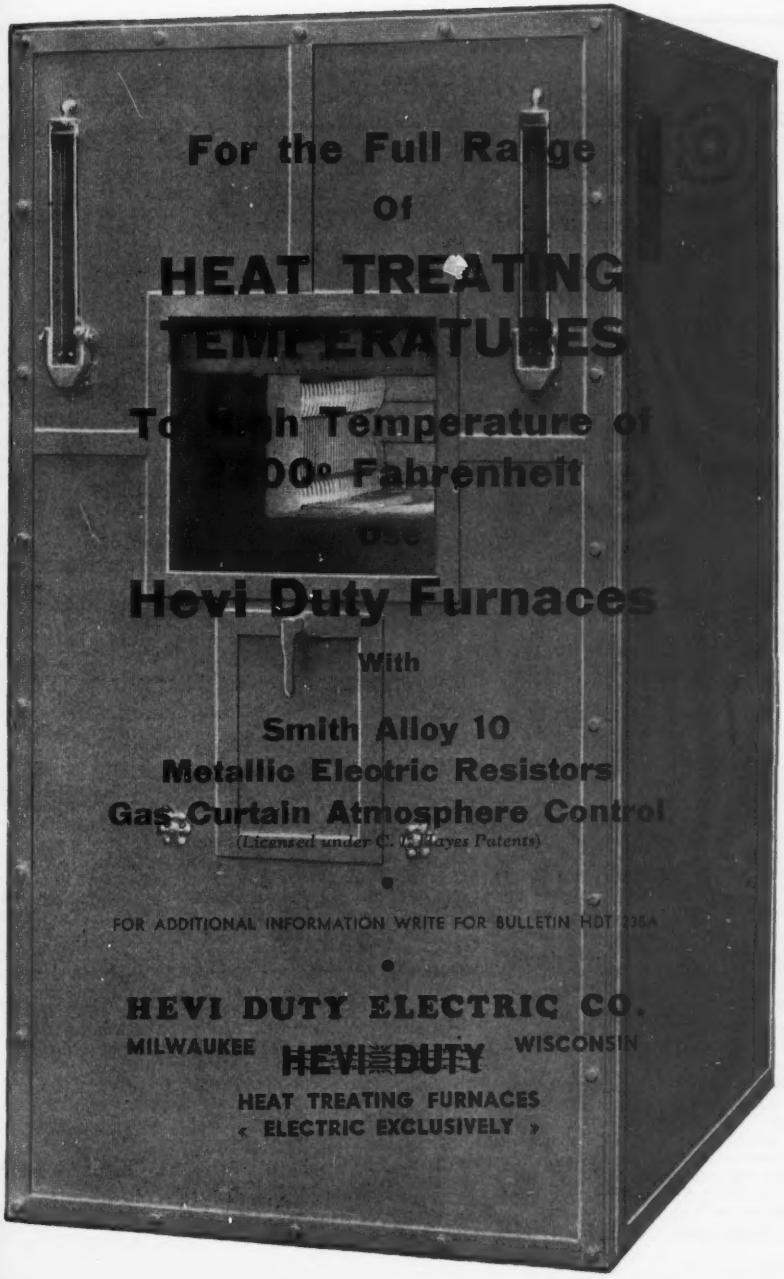
"To me it is incredible that in an age of so much tragic, crying, unfilled human needs we should think it necessary now to set out on the Quixotic attempt to increase welfare by destroying wealth or declining to create it. Our ancestors fought valiantly over the centuries to conquer famine. Are we now to say that they made too good a job of it; that their conquest of famine was too efficient? After the sweat of generations has brought us out of an economy of scarcity into at least the possibility of an economy of plenty, are we to confess that we are incapable of managing plenty and that the best we can do is deliberately to legislate a modified famine on the installment plan . . . . ?

"The coldest of cold facts is that scientific and technical leadership has abolished the physical necessity of poverty on this continent. It remains for political and economic leadership to abolish the social fact of poverty and its milder manifestation, underconsumption . . . .

"We must be very careful in the years ahead lest in our efforts to stabilize we succeed rather in sterilizing American enterprise. To play down our productive power while human need still stalks the streets may result in stabilization of want rather than stabilization of welfare."

For more than 400 years, down to within the past ten, this continent has been heralded as a land of opportunity. Colonists landed on our coasts with little more than determination and a few tools. As the eastern seaboard filled up, other pioneers struck out for the western frontiers. These brave souls built their own homes from the trunks of the trees, raised their own food, and established their own communities, fighting off murderous aborigines the while.

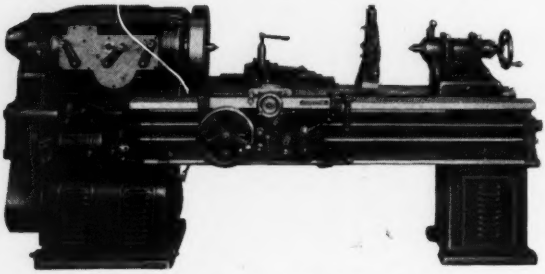
These men asked for nothing more than an opportunity to build their own homes and raise food for their families. America still has thousands of acres of good land lying idle, and there are no savages to fight. Has the process of civilization drawn the temper from our national backbone?


For the Full Range
Of
HEAT TREATING
TEMPERATURES
To High Temperature of
2000° Fahrenheit
Use
Hevi Duty Furnaces
With
Smith Alloy 10
Metallic Electric Resistors
Gas Curtain Atmosphere Control
(Licensed under C. E. Hayes Patents)
FOR ADDITIONAL INFORMATION WRITE FOR BULLETIN HDT 205A
HEVI DUTY ELECTRIC CO.
MILWAUKEE WISCONSIN
HEVI DUTY
HEAT TREATING FURNACES
« ELECTRIC EXCLUSIVELY »

New Shop Equipment

Sidney Sliding Geared Head Engine Lathe

The Sidney Machine Tool Co., Sidney Ohio, has brought out a sliding geared head engine lathe which is being made in two sizes—18-in. and 20-in. swing. The features of the lathe are ease of manipulation and speed in operation—features which are accompanied by unusual simplicity of design and freedom from unnecessary dials or control levers. The lathe is adaptable to rapid production work, yet capable of extremely fine accuracy.



Sidney Sliding Geared Head Engine Lathe

The lathe bed is made of a mixture of 50% steel and 1% nickel grey iron, presenting close grained texture with hard wearing surface. The four wall bed construction provides two side walls under each way tied together with double walled cross girts spaced on 12-in. centers. The bed is of the three vee type providing extra rigidity to the carriage and the bed ways will test not less than 200 Brinnell for hardness.

Twelve spindle speed changes are available through sliding spur tooth gears without the use of clutches. The gears are of alloy steel forgings, heat treated, ground, and with teeth lapped under working pressure. Alloy steel headstock shafts are fitted with multiple integral solid splines. Automatic lubrication is provided through a pump and spray system with oil filtered before distribution. All shafts in the headstock operate on Timken precision tapered roller bearings. The spindle bearings are oiled through individual copper oil lines from a reservoir.

The quick change gear box is a separate unit, tongued, grooved and bolted to the front of the bed. Gears are of alloy steel, accurately cut and heat treated. Forty-eight complete thread and feed changes are available without the use of loose gears. An auxiliary quadrant is provided, permitting cutting of special threads by use of extra gears. The apron is the double plate type with front and rear bearings for all shafts and studs. Shafts and studs are heat treated and ground. Oil reservoirs provide centralized lubrication.

A large circular swivelling block permits swivelling of the compound to any angle. The top slide has no overhang even when fully extended. The tailstock is of heavy duty design with long bearings on the bed and the tailstock spindle is provided with a bearing of full length in the barrel and graduated for full length of travel. The lead screw is made from turned and ground 0.45 to 0.55 carbon special screw stock. The threads are rough milled and accurately chased to a master screw.

The actual swing over the bed of the lathe, 18-in. machine, 20½ in.; 20-in. machine, 22½ in. Both sizes take 24 in. between centers on a 6-ft. bed. The weight of the 18-in. machine with base length bed is 5000 lbs.; 20-in. machine, 5200 lbs. Weight for each additional foot in bed, 440 lbs. Twelve spindle speeds are available ranging from 12 to 365 r.p.m. Maximum collet capacity, 1½ in. Spindle nose diameter, 4¾ in. Number of thread and feed changes, 48. Range of threads per inch, 1½ to 92. Range of feed per revolution, 0.0027 to 0.172 in. Horse power recommended, 7½ to 10.

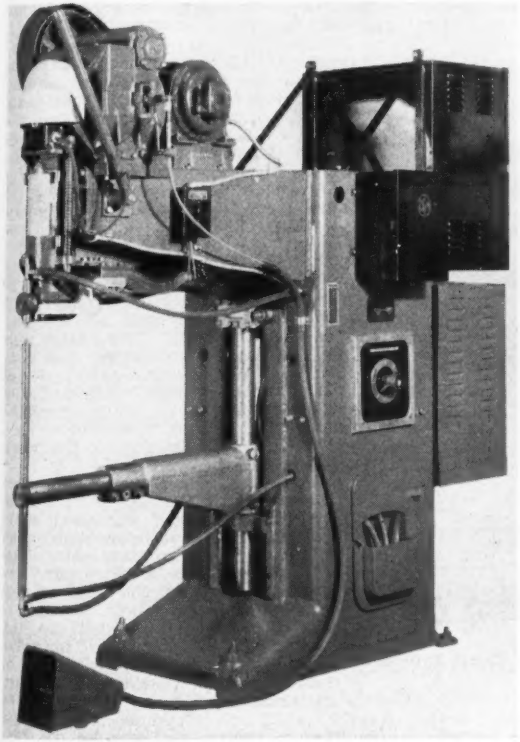
Special Thomson-Gibb Electric Press Welder

The illustration shows a resistance welder that has been developed by the

Thomson-Gibb Electric Welding Company, Lynn, Mass., for use in one of the larger navy yards on ship construction work. The welder is designed to weld two thicknesses of $\frac{3}{16}$-in. corrosion resisting steel plates at a production rate of 30 to 40 spots per minute.

An important feature of the machine is the special split type head which is equipped with a hand lever so that the upper electrode can be located on the work with perfect accuracy before the power-driven, mechanically-operated pressure devices go into action. This feature also provides for making spot welds on somewhat lighter materials by manually operating the upper head. A push button mounted at the end of the hand lever makes it possible to control both pressure and current by the same hand. The lower arm is adjustable through a range of 24 inches.

Other features of the machine are a 150-KVA capacity welding transformer, and two 7-point regulator switches which in combination provide 49 points of welding voltage and current regulation, and an automatically adjustable timing device.



This Special Thomson-Gibb Press Welder will weld two thicknesses of 3/16-in. steel plates at 30 to 40 speeds per minute.

American 12-Speed and 9-Speed "Hole Wizard" Radial Drilling Machines

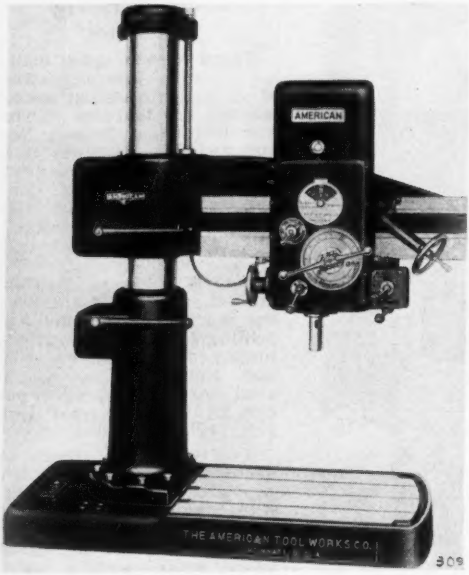
Higher speeds, lower drilling costs, less operating effort, and minimized maintenance are features of the American Hole Wizard Radial Drilling Machines now being built by American Tool Works Company, Cincinnati, Ohio, in both 9-speed and 12-speed designs. The 12-speed "Hole Wizard" is proportioned for and equipped with a 5 h.p. built-in motor which gives the machine an economical drilling capacity of approximately 2 in. diameter in cast iron and 1½ in. in steel with a tapping capacity of 2 in. in cast iron and 1½ in. in steel.

Twelve spindle speeds in geometric progression are provided, covering a standard range of 50 to 1500 r.p.m. This range may be varied by the use of pick-off gears within certain speed ranges. These speed ranges are based on the use of a 60-cycle alternating current motor and will vary somewhat with the use of motors of different cycles. The entire range of 12 spindle speeds is secured through three levers conveniently located at the right side of the head.

The spindle reverse required for tapping is accomplished by means of an almost instantaneously reversing motor, eliminating the use of the orthodox tapping attachment. The motor is guaranteed to reverse the spindle when running at highest speed from full forward to full reverse in approximately 1½ seconds.

The head is completely equipped with

anti-friction bearings and is automatically oiled by means of pump lubrication. It is mounted on two large roller bearings operating on a hardened steel guideway located at the lower portion of the square type arm, which provides the narrowest possible guideway for the head mounting. Traverse along the arm is accomplished manually by means of a large hand wheel located at the lower right hand side of the head, one revolution of which moves the head 3 in. All speed changing mechanism is located within the head casting as is also the spindle feed unit; consequently both speed and feed controls are entirely from the head.



American 9-Speed "Hole Wizard" Radial Drilling Machine

All shafts are made from heat treated alloy steel and are multiple splined, loose keys being avoided. All gears used throughout the head mechanism are made from chrome manganese steel forgings, are double heat treated and oil-hardened, and each mating pair is machine lapped under predetermined load in the most modern type of lapping machines.

The spindle and spindle sleeve are of surface hardness, and the spindle sleeve "Nitralloy" steel, nitrided for extreme is honed to size. The sleeve is mounted in precision Timken roller bearings and provided with means for adjustment to compensate for wear. The drive to the spindle is through hardened and lapped helical gears, the driving occurring at the bottom of the head at the closest possible point to the work, thus minimizing torque or twist and eliminating all tendency of the spindle to chatter in service. The entire head mechanism is automatically oiled.

Six rates of geared power feed are provided including 0.004, 0.007, 0.011, 0.014, 0.017, and 0.025 in. per revolution of the spindle. All power feeds are produced by a sliding gear feed unit in which the gears are hardened and lapped and the entire unit mounted in anti-friction bearings. The unit is automatically oiled.

Power elevating and lowering for the arm are provided as standard equipment, this vertical movement of the arm being accomplished by means of a small ¾ h.p. ball bearing rolled shell type motor and reversing drum built into a compact unit at the rear of the arm girdle. The entire unit is anti-friction mounted and runs in oil. An effective safety device is provided which automatically disengages the elevating mechanism of the arm, the tool or the head accidentally strikes the work while being lowered.

A plain box table which has two large working surfaces with T-slots for clamping, and universal table consisting of a standard base with a tilting table are available. The tilting table can be set at any required angle by the use of the graduated segment and worm.

This machine will drill to the center of a 72-in. circle. The maximum distance from spindle to base is 51 in. and the minimum distance is 14 in. Traverse of spindle is 12 in. Traverse of head on arm, 25¼ in.; traverse of arm on column, 25 in. The extreme height of drill over spindle, 97½ in. Height of base, 6 in. Working surface of base 30x42 in. Net weight, 5200 pounds.

The 9-speed "Hole Wizard" has practically the same design and construction as the 12-speed machine, with a few variations. This machine is equipped with a 3 h.p. built-in motor, giving the machine an economical drilling and tapping capacity of 1¼ in. in cast iron and ¾ in. in steel. The machine has 9 spindle speeds in geometrical progression covering a standard range of 70 to

MASTER
GAGEMAKERS

THE SHEFFIELD VISUAL *Cannot*
LOSE ACCURACY DUE TO WEAR

The use of the Reed mechanism, available exclusively in Sheffield Visual Gages, eliminates any need for gears, levers, knife edges or sliding friction. In functioning, the only movement is a slight deflection of the special spring steel Reeds—no rubbing, rolling, pivoting or rotation.

Consequently as there is no friction there can be no wear, and without wear, there can be no loss of accuracy. In short, the Reed mechanism which is the heart of every Sheffield Visual Gage, constitutes the ideal means of gage amplification. Without any of the disadvantages of mechanical amplification, it retains the extreme sensitivity characteristic of mechanical amplification.

The Sheffield is rapid as well as sensitive; records show as many as 3600 parts per hour checked to half a "tenth", or closer where desired.

If you want consistent gage performance and a high order of precision, standardize on Sheffield Visuals—the gages that do not wear out or become obsolete. Write for full particulars.

The **SHEFFIELD GAGE CORPORATION**

DAYTON • OHIO • U.S.A.

1500 r.p.m. This range can be varied to suit the user's requirements.

The start, stop and reverse for the spindle are obtained directly through the driving motor. A small motor control lever is located directly below the speed control lever in the most convenient location for the operator. This lever operates a double pilot control switch in conjunction with a magnetic reversing switch.

Four rates of geared power feed are provided including 0.004, 0.007, 0.012, and 0.020 in. per revolution of the spindle. This machine is built in two sizes: 3 ft. and 4 ft. The 3-ft. machine will drill to the center of a 72-in. circle and the 4-ft. machine to the center of a 96-in. circle. The maximum distance from spindle to base is 16 in. and the traverse of the spindle is 10 in. Traverse of head on arm, 3-ft. machine, 25¼ in.; 4-ft. machine, 37¼ in. Net weight, 3-ft. machine, 5300 lbs.; 4-ft. machine, 5500 pounds.

Grob Type OS20 Open End Band Saw for Internal and External Sawing

A 19-in. throat Open End Band Saw is being put on the market by Grob Brothers, West Allis, Wisconsin. It only requires half a minute to set this machine up for internal sawing such as dies, stripper plates and similar work.

As in the Grob Open End Band Saw with the larger throat of 25½ in., a saw band 140 feet long is helically wound on an aluminum drum. However, instead of having a tapered drum with a flat surface, the new drum is cylindrical, but has a threaded groove with tapered bottom. Instead of three, only one guide pulley is used above the table. Both the drum and the guide pulley have a diameter of 20 in. The guide pulley is lowered and raised by a lever on the left of the machine. By locking this same lever in various positions proper spring tension is provided to different sized saw bands.

The operation of the machine is completely electrically controlled. Motors and switches are built in, and a push button station as well as a speed changing knob are conveniently located for the operator. Speeds can be changed while the machine is in operation. Since the saw band travels over 20 in. diameter pulleys, bands with a thickness from 0.025 in. up to 0.050 in. can be used. A thicker band not only allows faster cutting, but also permits cutting of sharper curves.

The Bearing You Want--

You'll find it in the catalog of Bunting's Standardized Bronze Bearings. There are over 600 different sizes, completely machined and finished, ready for assembly. Sizes range from ¼" x⅜"x1¼" to 4"x4½"x7", meeting practically all requirements. Write for catalog. The Bunting mill supply wholesaler in your market carries Bunting machined and centered Cored and Solid 13" Bronze Bars in 121 stock sizes. Try this better bar. He can also supply you with Bunting Babbitt. The exclusive superior qualities will surprise you. The Bunting Brass & Bronze Company, Toledo, Ohio. Branches and Warehouses in All Principal Cities.

BUNTING Bunting **Quality**

BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

SKILLED MECHANICS PREFER

• VICTOR MOLY

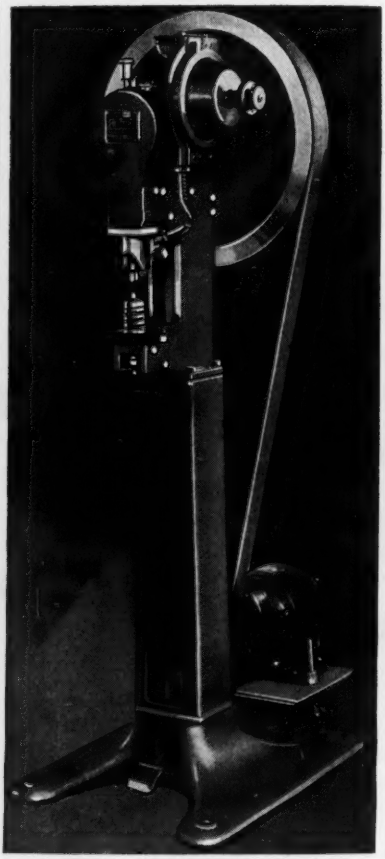
Even on the toughest steels and alloys Victor Hack Saw Blades cut true and fast. Mechanics prefer them because they can do better work in less time. Executives have found that these outstanding blades reduce production costs wherever they are used.

Made in sizes to meet every metal sawing requirement—both power and hand. Ask for them by name . . . know them by the distinctive gold color.

Victor Moly Hack Saw Blades are sold only through established distributors.

6999

VICTOR SAW WORKS, INC.
Middletown, N. Y.



THE RIVITOR

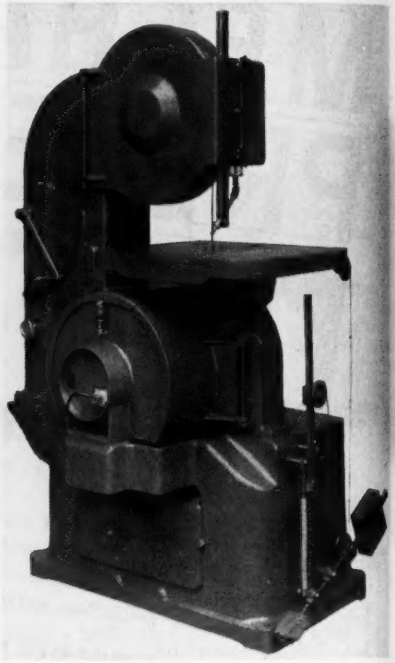
● Feeds and sets SOLID rivets automatically. The work is placed over the locator in the anvil. The rivet is fed automatically into the jaws which are carried down by the ram. The head is formed underneath the work. May we send you literature describing further these machines?

Tomkins-Johnson Co.

620 N. Mechanic Street, Jackson, Mich.
European Office: GASTON E. MARBAIX LTD., Vincent House, Vincent Square, London, S. W. 1, England.

A four speed ¾ h.p. motor provides four cutting speeds: 50, 75, 100, and 150 feet per minute to the saw band, and another ¾ h. p. motor provides the reverse speed, 500 feet per minute.

The sawing table, 24x28 in., is tiltable in two directions. The saw band guides above and below the table are adjustable in height. The table is equipped with a slide which is connected with a feeding device operated by weight. The



Grob Type OS 20 Open End Band Saw

weight is adjustable and works in connection with an oil dash pot. The latter prevents too fast feeding of the work piece, so that bumping against the saw blade is eliminated.

A limit switch is connected to the feeding device in such a manner that the saw band can not be reversed until the feed has been released. In connection with the table feed, a clamp has been developed that will securely clamp any shape of die block and which, instead of only feeding straight, permits feeding of curves. This device also makes it possible to very accurately fol-

IMPACT RESISTING

WHERE service conditions are most severe—where loads are heaviest—where impact, momentary overloads, and vibration are a problem—there NORMA-HOFFMANN PRECISION ROLLER BEARINGS demonstrate their extraordinary ability to absorb punishment.

Short parallel roller design—the use of a heavy-duty, completely machined bronze retainer—extreme refinement of workmanship and finish—these factors combine to give these PRECISION Roller Bearings a lower coefficient of friction under heavy loads than any other type of ball or roller bearing, together with a speed-ability equal to that of any ball bearing, size for size. Write for the Catalog. Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER and THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U. S. A.

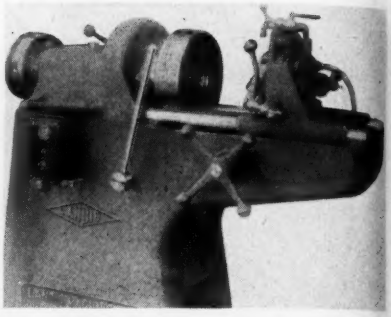
low a straight line.

The distance from floor to table is 48 in. The total height is 78 in., and net weight 2300 pounds. The machine is completely guarded with swinging doors and removable covers.

Chucks for Little Landis Pipe Threading and Cutting Machine

The Landis Machine Co., Waynesboro, Pa., announces a new development for their 2-inch Little Landis Pipe Threading and Cutting Machine in the form of a lever operated front chuck and a rear centering chuck. Heretofore, this machine was furnished only with a three jaw universal front chuck and no rear chuck, and which still remains standard equipment for the machine.

Should speedier operation and additional support for the pipe be desired, the lever operated front chuck and rear centering chuck as shown in the accompanying photograph can be supplied. The lever operated chuck has a universal adjustment for size, and can be changed for any diameter within the range of the machine, ¼- to 2-inch pipe, by loosening one locking nut. The chuck is graduated for all diameters of pipe and can be changed for size in a few seconds.

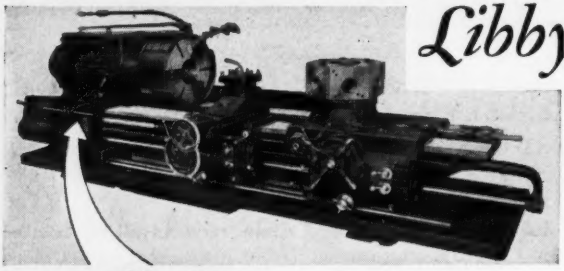


Little Landis Pipe Threading and Cutting Machine equipped with Lever-Operated Front Chuck and Rear Centering Chuck

The rear centering chuck is of the three jaw universal type. It is fitted with a knurled ring for manual operation so that no wrench is required. It does not grip tightly but is intended only for centering and supporting the pipe.

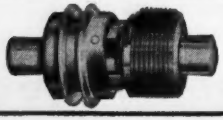
The rear centering chuck can be applied to machines now in service. The lever operated front chuck must be built

PULLMORE CLUTCHES Used in *Libby* International Turret Lathes



Two Double-type Pullmore Clutches are used in the rapid traverse mechanism of the Libby turret lathe shown at the left. They fit neatly into the design of the machine — "bear the punishment . . . stand the gaff"—and are easily adjusted when this eventually becomes necessary.

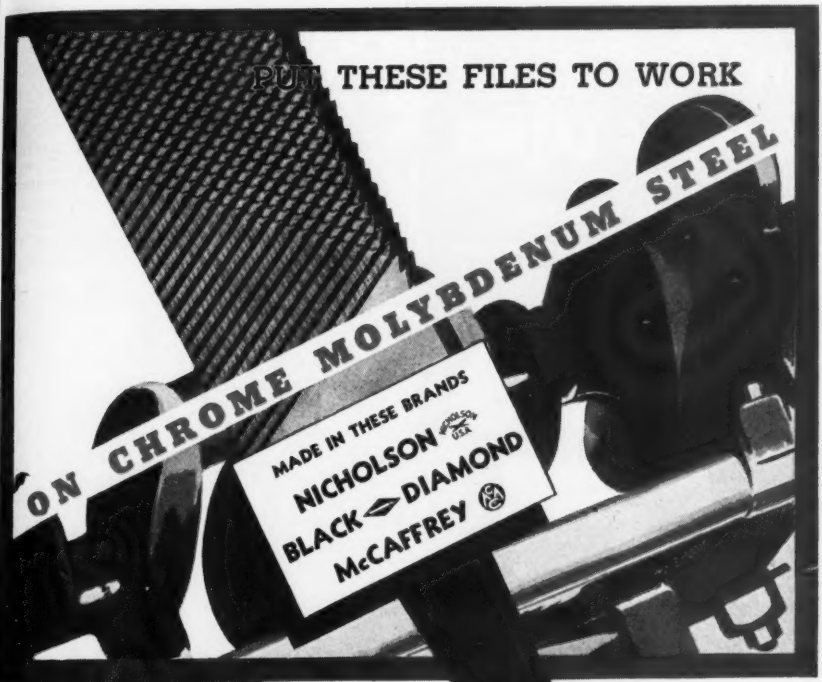
Pullmore Clutches are made in single and double types, for operation in oil or dry, in capacities ranging from 1 h.p. to 75 h.p., at 500 r.p.m.



Pullmore Clutches are highly satisfactory in many other kinds of machinery. They are compact, powerful, adaptable and durable. If you require an efficient, economical clutch—investigate the Pullmore. Write today for complete details.

ROCKFORD DRILLING MACHINE DIVISION
Borg-Warner Corporation, 300 Catherine Street, Rockford, Illinois

Sold by MORSE CHAIN CO., Ithaca, N. Y., Offices in principal cities



WHY THESE FILES REMOVE MORE CHROME MOLYBDENUM STEEL:

- Up to 3 times as many cutting edges per square inch.
- Reserve cutting edges go to work as old ones wear down.
- Modern tooth construction keeps file on line of work.

PATENTS PENDING

There's a test for any file. Chrome molybdenum steel. The modern steel — the hard steel — used in hundreds of industrial plants.

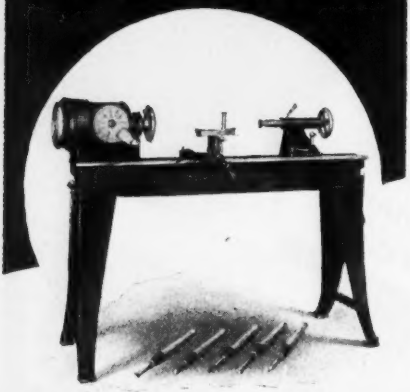
Put Nicholson, Black Diamond or McCaffrey Files to work on chrome molybdenum steel. Check the filing time. Notice the condition of the teeth of these new files when ordinary file teeth are worn down.

Test these files on chrome molybdenum steel or on other steels — or cast iron, brass or bronze — you'll find Nicholson, Black Diamond and McCaffrey Files the sharpest, fastest, most durable files that carefully spent dollars can buy. At mill supply dealers. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

"OLIVER" Metal
SPINNING LATHES

Spins metals smoothly . . .
stands tremendous pressures



- Extra heavy bearings
- Live tail center
- Adjustable speed motor-headstock

This Spinning Lathe has strong, rigid bed and heavy bearings in headstock to stand tremendous leverage. Has live tail center, adjustable tool rest. Ball or roller bearing headstock. Made in several capacities. Also supplied with motor-belt-drive. Investigate the details of this great Lathe.

Perhaps these "Oliver" Metal Working Machines will make your plant more efficient . . .

Die Filers	Speed Lathe
Tool and Casting Grinders	Metal Cut-Off Saw
Belt Surfacers	Metal Band Saw
Disk Grinders	Band Saw Brazer

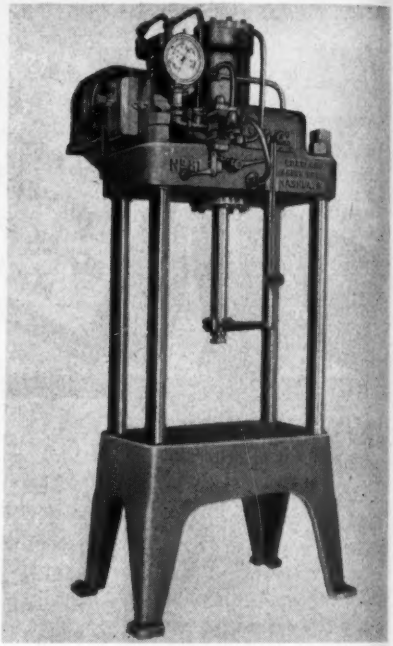
Write for illustrated folders

OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN

into the machine at the time of construction and can therefore be supplied only with new machines.

Greenerd No. 81 Hydraulic Press

A self-contained hydraulic press, to be known as the No. 81, has been brought out by Greenerd Arbor Presses, Nashua, N. H. The press is self-contained with pressure controls to 15 tons on the down stroke and 13 tons on the up stroke. The machine is particularly adapted for light plastic molding inasmuch as the pressure on the down stroke may be



Greenerd No. 81 Hydraulic Press

held even until the plastic sets and then released with a 13 ton pull to open the mold. Adjustments may quickly be made to control the pressure most suitable for different kinds of work up to 15 tons.

The combination low and high Vickers pump is driven by a 3 h.p. motor mounted on the side of the head with the tank in the head. The head is a special semi-steel casting. The piston is of steel with six cast iron piston rings and the ram gland is packed with chevron type packings.

LUFKIN

TAPES - RULES - PRECISION TOOLS

Your Tool Room needs a set of LUFKIN MICROMETERS

Set illustrated No. 191E 0 to 12 inch

For final checking purposes every well equipped Tool Room should have a set of accurate Micrometers

LUFKIN Micrometers are the last word for accuracy, long wear and ease of adjustment. The measuring screws are uniform in accuracy throughout their entire length; the anvil and spindles are of special hardness steel to give unusually long wear; the patented adjustment feature makes it a simple matter to keep the Micrometer in absolute adjustment at all times and the reading line remains in its original position throughout the life of the Micrometer.

Micrometer Sets are available in various combinations:

0 to 3 inch | 0 to 6 inch | 6 to 12 inch | 0 to 12 inch

Specify LUFKIN Tools For Your Shop Equipment

Send for Tool Catalog No. 7

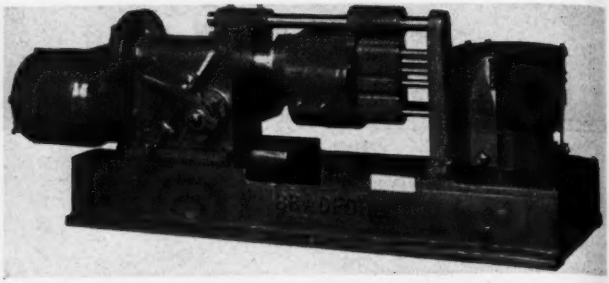
NEW YORK 106-110 Lafayette St.

THE LUFKIN RULE CO. SAGINAW, MICHIGAN, U. S. A.

Canadian Factory WINDSOR, ONT.

The control valve may be either foot or hand operated and automatic or manual reverse can be made at any point. A stop rod regulates the length of travel in either direction. When the ram is at top position, the pump bypasses, relieving all pressure.

The working surface on the base, within uprights, is 18x24 in. Clearance over the working table is from 17 to 30 in. as specified. The diameter of ram, $2\frac{7}{16}$ in. Stroke, 17 in. The travel on the down stroke is 116 in. per minute under no load and on the up stroke is 148 in. per minute under no load. The travel on the down stroke with a 2 to 6 ton load, is 113 in. per minute and is 33 in. per minute with a 6 to 15 ton load. The 17 in. stroke is taken in $10\frac{5}{8}$ seconds with 2 to 6 tons and in 30 seconds with from 6 to 15 tons. Standard equipment includes a 3 h.p. 220, 440, or 550, 2 or 3-phase, 50 or 60-cycle motor and controls.



Bradford Bench Type Semi-Automatic Drilling Machine

Bradford Bench Type Semi-Automatic Drilling Machine

Illustrated herewith is a bench type semi-automatic five spindle drilling machine which was recently built by the Bradford Machine Tool Company, 659 Evans St., Cincinnati, Ohio, for drilling 45 holes in a Textolite bucket for rayon spinning. The holes in the bucket are located in 9 groups of five holes each, spaced equally around the periphery of the bucket. Four other holes in each group are No. 55 and one is No. 48.

Industrial Leaders Are Cutting Costs with Auto-Shift Tables

Industrial leaders who watch costs and efficiency most closely have endorsed Hamilton AUTO-SHIFT Tables by equipping exclusively with them. Investigate and you'll want to invest in Auto-Shift Tables. Names of prominent users furnished on request.

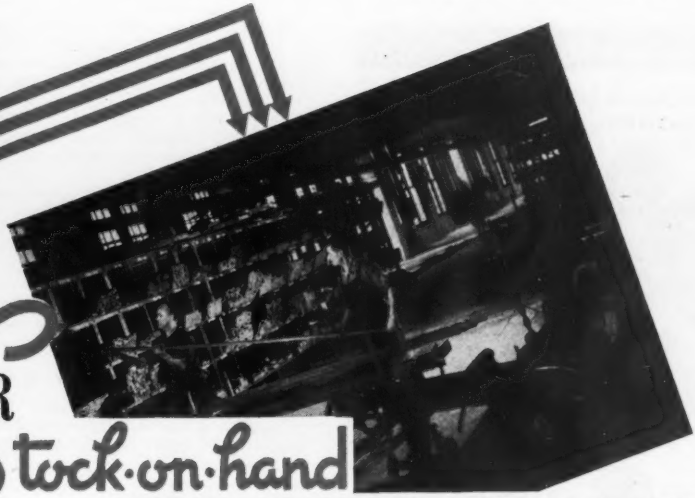
HAMILTON MFG. CO.,
TWO RIVERS, WIS.

Creative Men Appreciate Auto-Shift Tables

HAMILTON MFG. CO., Two Rivers, Wis.
Please forward New Catalog No. 10. M M-6-36
Name.....
Title.....
Firm Name.....
Address.....
City..... State.....

Write for Catalog

HAMILTON
Drafting Room FURNITURE



YOUR Stock-on-hand JUST AROUND THE CORNER

● At every important center, stocks of Union Cold Drawn Steels are carried in distributors' warehouses. Standard shapes and sizes, cut to required lengths, are quickly available. The distinction between these stocks and your inventory—from a standpoint of getting them into production—is only a matter of hours.

Distributors bear all the overhead costs of storing and maintaining your "stock-on-hand." If there is any depreciation, they take the loss. If certain sizes move slowly, that is their lookout. They invest their capital—provide storage space and trucks—employ a trained warehouse and office staff—encourage small as well as large accounts—make deliveries by the bar or the carload. Their service is valuable. It reduces industrial costs. It saves money for you.

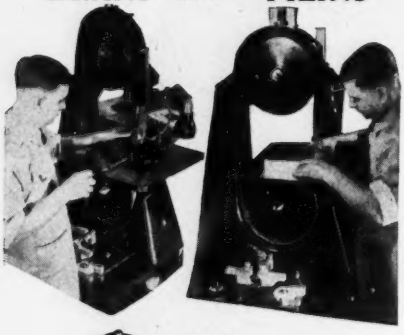
Well known distributors warehouse Union Cold Drawn Steels because high quality enlarges all the benefits of good service. Union Drawn Distributors serve industry faithfully.

PROMOTE EFFICIENCY WITH

Union Cold Drawn Steels

CONTINENTAL DO-ALL

INTERNAL SAWING AND INTERNAL FILING



ALSO
BAND POLISHING
All 3 with
INFINITELY
VARIABLE SPEED

A TYPICAL JOB

"BUILT IN"

- Automatic Electric Saw Brazer and Lap Grinder.
- Infinitely variable speed (75 to 475 ft. per min.).
- Geared reduction unit.
- Air pump and pulsating air jet.
- Baffle and tube to carry chips out the back.
- Power work feed (Automatic).
- Control Switches and 2 motors.
- Pilot Lamp.

4 MODELS AVAILABLE

HEAVY DUTY MODEL $790.00 Complete

Write for Catalog

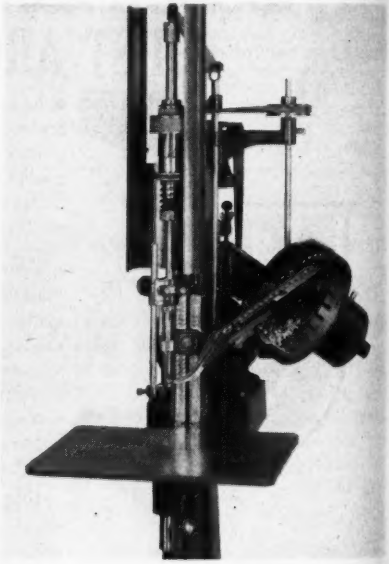
Continental Machine Specialties, Inc.
1301 S. WASHINGTON AVE.
MINNEAPOLIS, MINN.

The operator loads the bucket in the fixture by simply pressing it down into three spring actuated fingers and then raises the starting lever of the machine. The machine runs 45 seconds, during which time it drills all the holes in 9 automatic indexes, after which it stops until again reloaded and started by the operator.

A requirement of the operation is that the holes be cleanly drilled and that they break through the inside of the bucket without burrs or defects—and this is difficult to achieve with the material of which the bucket is made. The machine operates at a net production of 60 buckets per hour at 85% efficiency.

Magazine Feed Power Screwdriver

A magazine feed power screwdriver equipped with a universal barrel-type hopper has been announced by the De-



Detroit Magazine Feed Power Screwdriver Equipped with Universal Barrel-Type Hopper

troit Power Screwdriver Company, 5365 Rohns Ave., Detroit, Mich. The design of the machine is unique in that the barrel-type hopper makes it especially adaptable for short length screws having large-diameter heads. The capacity of the machine is from No. 4 screw to ¼-in.

DID OUR DISPLAY AT THE FOUNDRYMEN'S SHOW CONVINCE YOU?

that Sterling is among the foremost manufacturers of grinding wheels for the Foundry industry?

The wheels you saw were stock duplicates of those used in thousands of America's leading foundries - - concrete proof that Sterling needs no introduction to your industry.

Our many years of experience in foundry grinding is at your disposal, our engineers stand ready to assist you on any grinding problems - - without obligation, of course. Try Sterling - - the wheels you can depend upon.

THE STERLING GRINDING WHEEL COMPANY

Abrasive Division of The Cleveland Quarries Company

Factory and Office: TIFFIN, OHIO CHICAGO: 912 W Washington Blvd. DETROIT: 101-107 West Warren Avenue

STERLING ABRASIVES

diameter screw. The universal principle of the hopper permits changing from one screw size to another, within the capacity of the machine, with but two sizes of collector rings.

The illustration shows the barrel-type hopper with the hopper rings removed. The collector ring rotates and collects the screws from the mass held in the hopper ring, delivering them to a point in line with the storage tracts. Jamming of screws at the delivery point is prevented by an adjustment of the inner diameter of the collector ring which allows screws to be carried past the end of the tract without disturbing the screws in the tract.

Power is supplied by a motor mounted on a bracket at the rear of the machine and is transmitted to the spindle by belt. The reduction gears which operate the hopper run in oil baths.

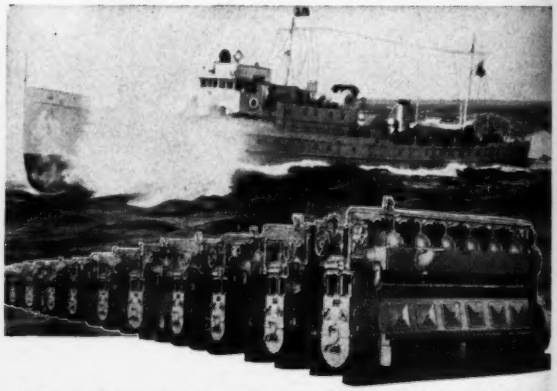
The machine is operated by means of a foot lever which controls an escapement, operation of the lever releasing a screw from the storage tract and delivering it to the gripping fingers. In the same movement the spindle travels downward, engages the screw, and drives it. Any tension desired can be obtained by the adjustment of the friction clutch. The gripping fingers are adjustable to the size of the screw shank. As the screw enters the thread, the gripping fingers release, allowing the screw head to pass freely. The bit is perfectly muted as it leaves the slot after driving the screw; thus screws with high polished heads can be driven without danger of marring the heads. All parts of the machine are easily accessible and the change from one screw size to another can be made in a few minutes.

Grob Velocity Action Briquetting Machine

Grob Brothers, West Allis, Wisconsin, have developed a Metal Chip Briquetting Machine in the design of which a new principle is employed. A main feature of the machine is that there is no pressure whatsoever in any working part of the machine while the briquette is being formed.

The machine consists of a constant-speed revolving main drive shaft and a crank which is connected with a connecting rod to a ram revolving on the same axle as the main drive shaft, but entirely independent from same. On the main drive shaft is a drive dog carrying the crank to its upper position. From

WINTON comes to BANTAM



HERE is a string of thirty-six Winton Diesel Engines, 670 H.P. each, furnished recently for eighteen United States Coast Guard cutters. Each of these Winton Engines, like practically every other Diesel made, is equipped with Bantam Quill Roller Bearings.

This is just one more indication of industry's rapidly growing reliance on Bantam. When you consider that 95% of the automobiles using quill bearings use Bantams, that practically all Diesel Engine builders use them and that there were more large Bantam installations listed in the steel mills during 1935 than all other makes combined, there are evidently some good reasons why you should use them in your product.

Write and tell us your requirements, or ask us to send a Bantam Engineer.

THE BANTAM BALL BEARING CO.
SOUTH BEND, INDIANA

(SUBSIDIARY OF THE TORRINGTON CO.)

BBB TAKE YOUR TOUGHEST BEARING JOB TO BANTAM

KNURLED UNBRAKO

Socket Head Cap Screw

Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster, as his fingers actually become geared to the Knurled Head so they can't slip.

Smooth Head Screws, hard to get hold of are much slower to drive.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako",—

BUT COSTS NO MORE.

U. S. & Foreign Pats. Pending

Order by Name—Specify:

The KNURLED "UNBRAKO"

FREE SAMPLES

STANDARD PRESSED STEEL CO.

Jenkintown, Pa.

Branch Offices and Warehouses

DETROIT CHICAGO ST. LOUIS
NEW YORK BOSTON SAN FRANCISCO
PITTSBURGH

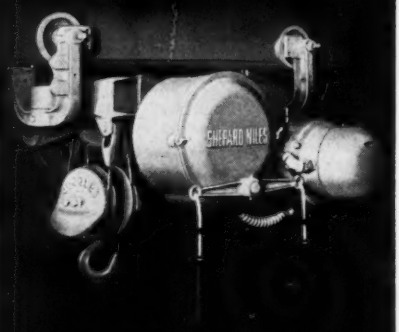
U. S. & Foreign Pats. Pending
Fingers become geared to the knurled "Unbrako" and therefore can't slip

SHEPARD NILES

DIRECT WORM DRIVE

Electric Hoists

1/4 TO 6 TONS CAPACITY



CLOSE HEADROOM; AUTOMATIC LUBRICATION; ROPE OR PUSH BUTTON CONTROL; ANTI-FRICTION BEARINGS.

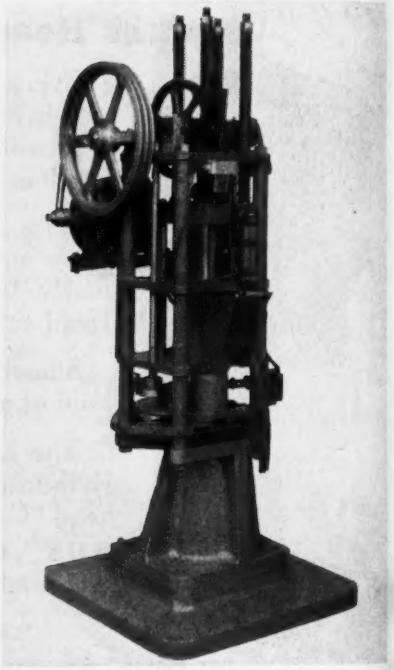
WRITE FOR BULLETIN

SHEPARD NILES
CRANE & HOIST CORP.
424 Schuyler Ave., Montour Falls, N. Y.
Export: 111 Broadway, N. Y. C.

MOST COMPREHENSIVE LINE OF CRANES AND HOISTS

this point the gravity as well as spring pressure accelerate the ram and the crank travels ahead of the drive dog. The lower part of the ram carries a hardened steel plunger, which, when the ram drops, enters a hardened steel bushing which previously was filled with metal chips.

A number of steel bushings, located in a turntable, pass in succession through various stations. At the first



Grob Velocity Action Briquetting Machine making 1-in. dia. Briquettes.

station, the bushing passes underneath the hopper where the bushing gets loaded with chips. At the second station, the briquette is formed by a blow from the released ram. At the third station a knockout plunger ejects the finished briquette.

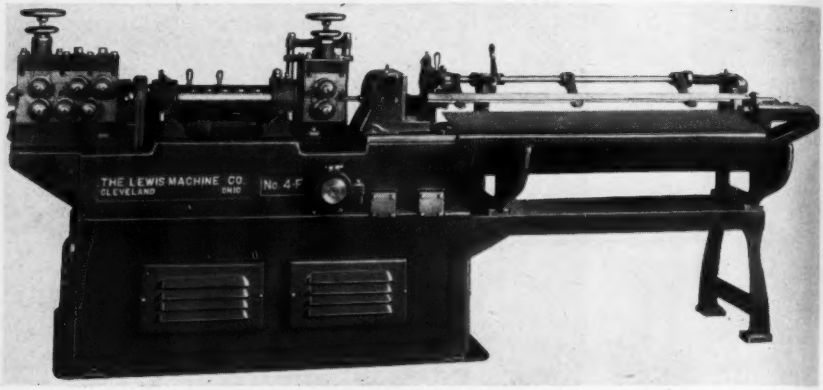
The turntable is indexed by the so-called Geneva motion. A number of important safety devices are incorporated in the machine. The machine has a main hopper which feeds into an auxiliary hopper. This auxiliary hopper

The Jacobs Plain Bearing Improved Chuck

New methods of thread generation in body and jaws give increased grip—greater chucking speed. Practically unbreakable parts assured by new design and modern heat treating. Hardened body and stronger parts result in a chuck with just about double wearing quality. Made correctly balanced and light for sensitive drilling, medium duty for machine use and portable tools—and in special hollow body models for accurate valve refacing and for use on the lathe headstock.

THE JACOBS MANUFACTURING COMPANY

HARTFORD, CONNECTICUT



Lewis "Travel-Cut" Automatic Wire Straightening and Cutting Machine

feeds chips into the bushings passing underneath. A safety door is located on the auxiliary hopper in such a way that should anything like a screw, a bolt, or a broken tool project beyond the upper surface of the bushing, the safety door would open and let the undesired object pass along with the bushing. The safety door is held shut by heavy springs. The instant this safety door opens, a latch will hold the ram in the upper position so that the ram cannot close in on anything projecting beyond the upper surface of the bushing.

A further safety device is provided so that if no metal chips are fed into the machine, indicating that the hopper is empty or clogged, the machine will also automatically stop.

Lewis "Travel-Cut" Automatic Wire Straightening and Cutting Machine

The machine illustrated is the Lewis "Travel-Cut" Automatic Wire Straightening and Cutting Machine now being marketed by Lewis Machine Co., 1592 East 24th St., Cleveland, Ohio. The machine is referred to by the manufacturer as a "modern flying shear," inasmuch as it feeds the wire from the coil, straightens, gauges to accurate length, and cuts the wire on the fly. This method is said to assure a uniform diameter rod throughout the entire length and to produce a rod free of feed roll marks.

Although the machine is equipped with an instantaneous acting roll type clutch, the cutting of accurate, uniform lengths does not depend upon the accurate engagement of the clutch or brake adjustment, the machine being so designed that it will cut uniform lengths under all working conditions.

The cut-off die is anchored in the traveling cut-off head, which has vertical ways to guide the cut-off knife holder. The head moves forward with the wire during the cutting operation and the cutting knife is operated by means of a quick-action cam on the flywheel shaft. The length of the cut is determined by a gage which travels with the cut-off head. Accurate lengths are assured without critical adjustments of any kind.

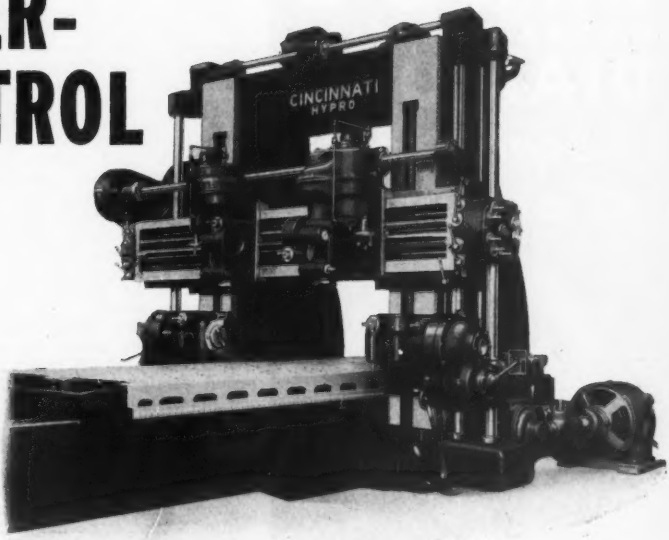
The cut-off head is designed to permit very low head construction, the distance from the ways to the center line of the wire being reduced to the minimum. This construction eliminates any tendency to rock at the end of the stroke or produce uneven wear on the head or bed ways. A roll straightener rough straightens the wire before it enters the rotary straightener arbor where a standard five-die steel rotary straightener is used for the finish straightening operation. Any type of straightener die best suited for the wire can be used. The dies are of ample length to provide sufficient end bell for starting the end of the wire through the machine.

All main drive units are fully enclosed in oil housings, including the flywheel and clutch which are mounted in a closed housing and run in a constant bath of oil. The cut-off drive mechanism is completely sealed in the machine bed and the cut-off cam and cut-off head drive crank run in oil. Forced feed

CINCINNATI HYPRO PLANER TYPE MILLER

offers

SUPER-CONTROL



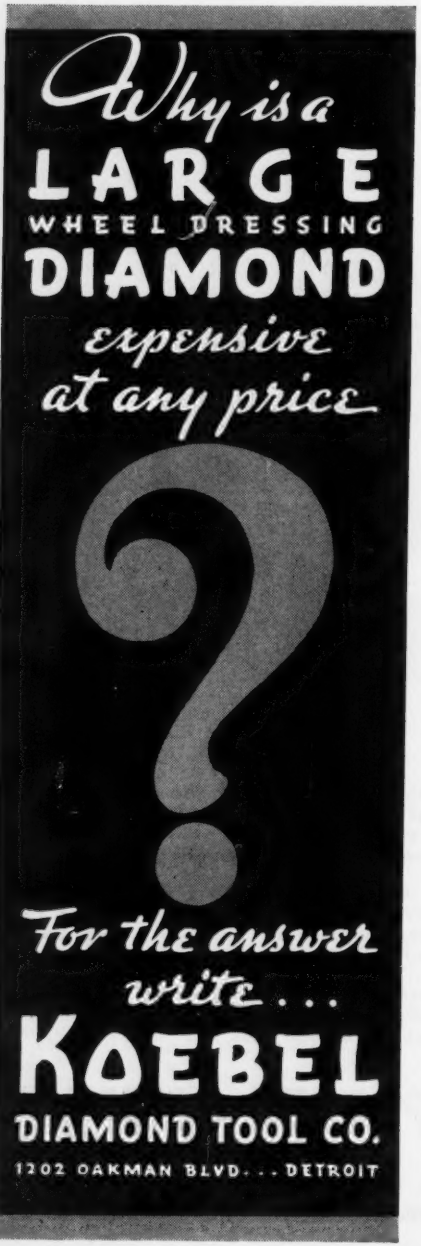
Perfected SUPER-CONTROL of the great power of CINCINNATI Planer Millers makes possible not only their high productive capacity, but also their outstanding accuracy and low operating costs.

Equip for the future as well as the present with CINCINNATI Planers, Boring Mills and Planer Type Millers. Planers from 22" to 120", both Double Housing and Openside.

May we furnish you with complete information and also with the location of the CINCINNATI machine now in operation nearest you?

THE CINCINNATI PLANER COMPANY

CINCINNATI, OHIO **U. S. A.**



lubrication is provided to the cut-off head ways in the bed.

Extension support brackets are mounted on a rigid steel base extending from the machine base the full length of the extension. The brackets are constructed to hold the cut lengths away from the machine so that they can readily be removed without interfering with the operation of the machine. A T-shaped gage wire fits into a T-slot in the guide bar and is thus supported to the end without the use of removable clips. Wire feeding through the machine into the guide bar cannot bend or jam this type of gage wire.

The machine is driven by a V-belt from a motor which is mounted on an enclosed steel base. One set of belts drives the rotary straightener arbor and another set drives the transmission. All transmission gears are alloy steel, heat treated and fully enclosed. Feeds and flywheel speeds best suited to the wire to be straightened and to the cut are obtained by simply shifting the transmission levers. All sliding gears are mounted on spline shafts. The rotary straightener arbor is mounted on ball bearings, and all main drive shafts, feed and straightener shafts are mounted on Timken roller bearings.

27x36-In. Wheelabrator Tum-Blast

A new small Wheelabrator unit designed especially for use in foundries, shops and plants having a limited production, is announced by The American Foundry Equipment Company, 557 Byrkit Street, Mishawaka, Ind. The new Wheelabrator unit is installed in a new size Tum-Blast mill. While smaller in size, this mill has all the desirable features which are responsible for the international popularity of the larger Wheelabrator Tum-Blast.

Material to be cleaned is loaded directly onto the apron conveyor. When the mechanism is set in operation the action of the conveyor apron cascades the individual castings, over and over, directly under the blasting area, assuring complete coverage at all times. In unloading, the movement of the conveyor is reversed, allowing cleaned products to spill into waiting receptacles under the machine.

Centrifugal force replaces compressed air as a driving agent in whipping abrasive onto the work to be cleaned in the Wheelabrator. Abrasive is fed by gravity from an overhead storage bin in the center of the Wheelabrator. After blasting, it drops through holes in the conveyor plates into a hopper below where

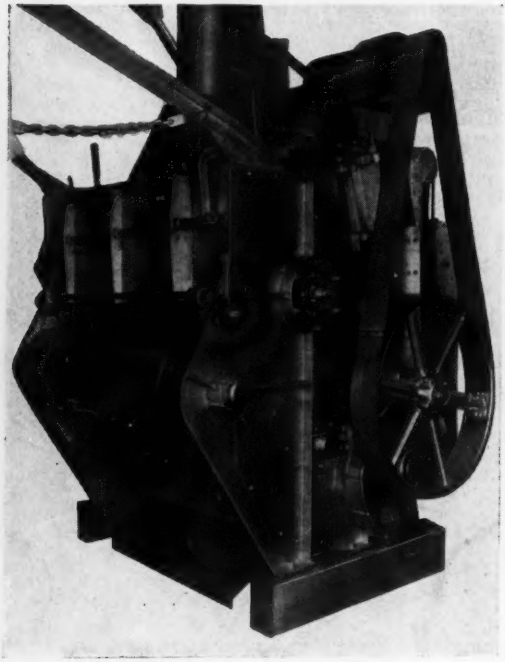
Truly efficient plant operation demands light—not for average eyes, but for the poorest eyes it is willing to employ. Cooper-Hewitt Mercury Vapor Light reveals details and quickens visual response to such a great extent that it is "like glasses for poor eyes."

Skilled workers speed through entire shifts without eye-strain fatigue. They turn out products uniform in quality, and management finds Cooper-Hewitt Light materially cuts down rejects—a direct profit. Save the energy your workers ordinarily waste in the mere physical act of "seeing." Give them the assistance of Cooper-Hewitt Mercury Vapor Light. You will banish harsh contrasts between light and shadow . . . eliminate glare . . . reduce accidents . . . and minimize labor turnover. Get full data on this detail-revealing, restful Cooper-Hewitt Light. Address the General Electric Vapor Lamp Company, 897 Adams Street, Hoboken, New Jersey.

GENERAL ELECTRIC VAPOR LAMP COMPANY

680C

COOPER-HEWITT MERCURY VAPOR LIGHT



27x36-In. Wheelabrator Tum-Blast

refuse is automatically screened out. Cleaned abrasive drops into the boot of a bucket elevator and is lifted to an overhead storage hopper for reuse. Steel grit or shot may be used over and over. Dust is carried out of the Tum-Blast by the American Dustube Collector operated in conjunction with the machine. The abrasive cycle used in Wheelabrating is constant until the machine is shut off for loading or unloading.

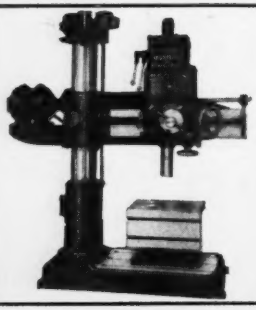
Many new developments are incorporated in the construction of the unit. The door is counterweighted for easy operation. It swings up and provides an unobstructed opening for loading and unloading. It is completely equipped with dust seals. The apron conveyor can be provided with either overlap or flat type slats, depending on the type of material to be cleaned. Both slats are furnished with heavy-duty reinforcing channels.

Having an operating load capacity of five cubic feet, the 27x36-in. Wheelabrator Tum-Blast answers the need of manufacturers with a limited production for automatic cleaning equipment which is both economical in operation and maintenance.

Preis Type GSO Single Lip Cutter Grinder

In order to promote speed and accuracy in the grinding of the single lip cutters used for certain special milling operations such as the engraving of lettering or the machining of molds, H. P. Preis Engraving Machine Co., 153 Summit St., Newark, N. J., has developed the Type GSO Single Lip Cutter Grinder shown in the illustration. The principle upon which the machine is designed is both simple and effective. Cutters may be ground to any desired shape in a minimum of time. With this machine the halving of the cutter can be performed with the greatest possible exactness, so that the cutter will produce a clean surface.

The exactness of the halving is controlled in the grinding machine by



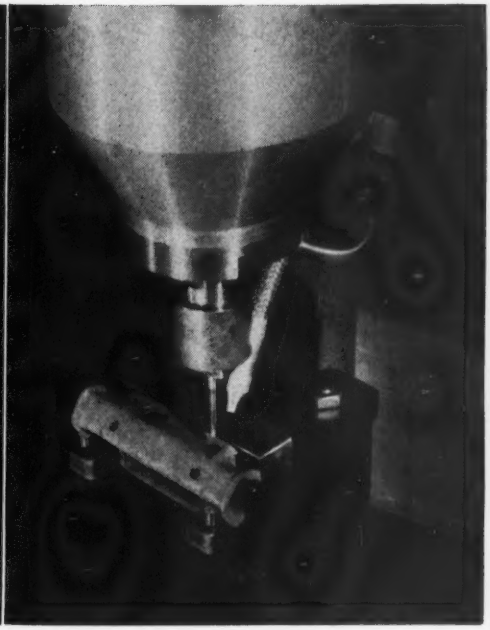
MORRIS "MOR-SPEED" RADIAL DRILLS

FEATURE:
Rigidity — Convenience — Power — Simplicity — Low Cost.

Don't fail to investigate the "MOR-SPEED" line of Radials. Full facts on request.

THE MORRIS MACHINE TOOL CO.
CINCINNATI OHIO

Tapping 4 DIFFERENT HOLES at 2 DIFFERENT ANGLES in 1 Operation



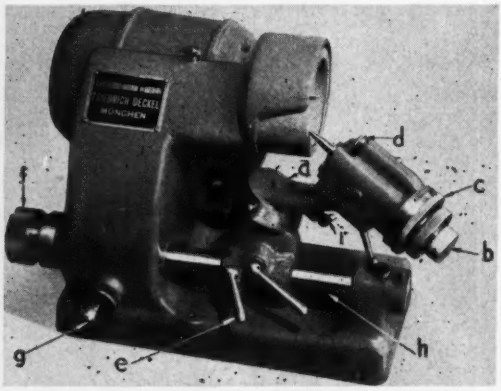
A simple swing fixture permanently fastened to the table! Foot pedal control! Both of the operator's hands left free to guide the work! No wasted motion. No lost time in locating or positioning. A job that took more time to handle than to tap . . . by the old method. A job made simple and easy by the exclusive Haskins Features. Our new, illustrated booklet describes the Haskins Tapping Method in detail. It's full of new facts on tapping. And it's free . . . write for it today. R. G. Haskins Company, 4667 West Fulton Street, Chicago.

ILLUSTRATED ABOVE—One of a Series of Case Histories Showing Tough Jobs Made Easy by The Haskins Tapping Method.

Material—Steel Stamping
Size of Tapped Hole—10-32"
Depth of Tapped Hole—3-32"
R.P.M. of Tap "In"—1750
R.P.M. of Tap "Out"—3500
Production (4 holes)— 480 pieces per hour

THE HASKINS METHOD

European Representative—G. E. Marbaix, Ltd., Vincent House, London, S. W. 1.



Preis Type GSO Single Lip Cutter Grinder

means of a micrometer. The halving may be followed up immediately by grinding the profile diameter, after which the cutter is ground to the diameter required for the approximate length of the halving. After halving, the lateral cutting edge and the face cutting edge are accurately ground, followed by grinding the chip clearance back of the cutting edge so that the hot chips may fly off the cutter without hindrance.

To hold the cutter for grinding the face, the cutter is inserted into the spring collet of the grinding bearing indicated at **B** in the illustration. The lateral adjustment of the grinding bearing is effected by moving the arm **A** on the axle **H** after loosening the clamping screw **E**. Adjustment for thickness of stock to be removed is obtained by means of the screw **F** after tightening the clamping screw **E**. The grinding length can be pre-determined exactly by the adjustable detent **G**.

For grinding the profile diameter, the ratchet pin **D** is pulled back and given a quarter of a revolution to hold it out of engagement so that the grinding bearing **B** may be revolved. To grind the lateral cutting edge, the edge is brought to the grinding wheel in a manner similar to that used in the halving operation and for this purpose the grinding arm **A** is set to zero on its lower scale so that the cutter axis is exactly at right angles to the shaft of the grinding wheel. The grinding bear-

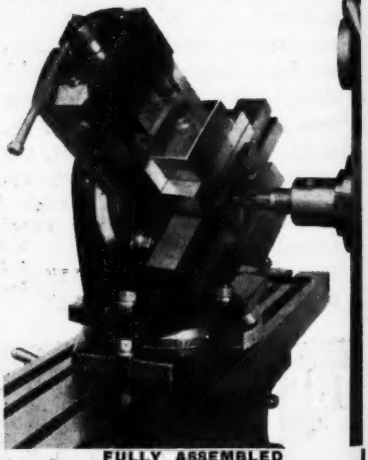
for **PRODUCTION** and for **TOOL ROOM**

ODIN UNIVERSAL PRECISION VISES

WILL ELIMINATE—
High Tool Costs
Expensive Fixtures
Patterns and Castings
Many Set-Ups

WITH—
Interchangeable Jaws
Hardened Ground Parallels
Every Angle or Degree
Positive Clamping

CONSTRUCTED OF—
Drop Forgings and Semi-Steel Castings
Horizontal and Vertical Bases Indexed 180
All Parts Are Interchangeable
Can Be Used In Part Or Fully Assembled
All Handles Are Removable

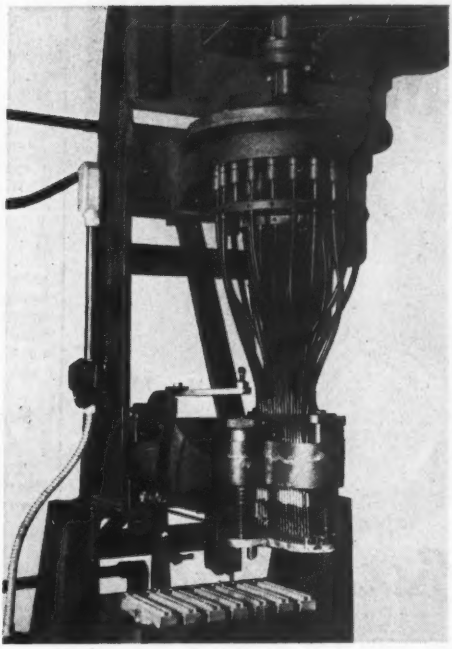


FULLY ASSEMBLED

ODIN UNIVERSAL CORPORATION
CHICAGO
Sales Division
110 S. Dearborn St.
Telephone
Franklin 3281

★

A time and labor saving machine made practicable by



S. S. WHITE FLEXIBLE SHAFTS

This multiple spindle drilling machine has 38 spindles, equipped with S. S. WHITE flexible shafts.

Any or all of the spindles may be used at one time, and the flexible shafts permit various arrangements of spindles to meet different drilling requirements. In drilling the castings shown in the illustration, 32 spindles are used with No. 32 drills.

The machine was manufactured and is used by the General Gas Light Co., of Kalamazoo, Michigan, and they have three of these 38-spindle machines; also three with 21 spindles and one with 8 spindles, using ¼" drills. The Company reports that *"the flexible shafts work very satisfactorily."*

S. S. WHITE cooperated in applying the flexible shafts to the machine and is prepared to aid engineers and designers in working out any flexible shaft problem. Ask us for recommendations—there is no obligation.

The S. S. WHITE Dental Mfg. Co., INDUSTRIAL DIVISION

10 East 40th Street, Room 2310S, New York, N. Y.

SMOOTHER

and

No. 707
7 inch Standard Portable Electric Sander

Less Vibration

You really must operate the new No. 707 Sander yourself to appreciate its superior performance.

On either metal or wood, it rapidly gives a fine surface for finishing. Its power, smoothness, and lack of vibration will surprise you. The pad is flexible. It can be used in close quarters. For heavier work our 9 inch No. 809 is also a leader in its class.

The complete Millers Falls line of sanders, grinders, and other portable electric tools is illustrated in electric tool catalog No. 4. We have a copy for you. It's free for the asking.

MILLERS FALLS COMPANY

Greenfield Massachusetts

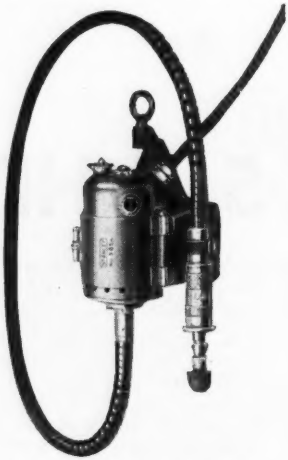
MILLERS FALLS TOOLS

ing is turned until the face of the lip of the cutter is at the cutting angle required and screw F is then tightened, after which the cutting surface is ground until a clean edge is obtained. Tapered shank flattened and rounded-off shape cutters are ground as easily as the operation described above.

The grinding wheel dresser consists of a diamond in a special setting which is clamped in the grinding spindle in the same manner as the cutter. The machine is of simple but sturdy design, and the workmanship is strictly a tool room job. All parts are nicely finished. The machine is entirely self-contained, power being supplied by a ¼ h.p. motor mounted on a bracket at the rear of the machine spindle. Power is transmitted to the spindle by means of a V belt.

Stanley No. 585-A High Speed Flexible Shaft Grinder

The Stanley Electric Tool Division, Stanley Works, New Britain, Conn., has brought out a flexible shaft grinder



Stanley No. 585-A High Speed Flexible Shaft Grinder

which, equipped with a full ⅜ h.p. motor, is said to maintain a high grinding speed. The features of the tool are ample power and a flexible shaft which permits fine, smooth grinding.

Attention is called to the unique construction of the flexible shaft. The layers are wound alternately left hand and

THERE IS A DIFFERENCE

It shows up IN **CUTTING SPEED**

• Not only cutting speed, but *safe* cutting speed plays a large part in your small tool satisfaction. The ability of Morse Tools to maintain high cutting speeds safely and economically is one of the reasons why production and shop men everywhere say "there *is* a difference."

What assures this difference in Morse Tools? Years of experience in the making of precision cutting tools put one extra value behind the Morse trade mark. Another results from carefully controlled hardening, another from exceptional accuracy in grinding. Step-by-step inspection adds its part.

Next time you hear someone say that all leading metal-removing tools are alike, tell him to try Morse Tools. Tell him it will be worth his while in lower costs and better work to prove to himself "there *is* a difference."

A conveniently located Morse Distributor assures prompt service.

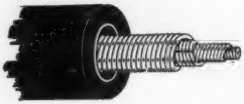
THE MORSE LINE INCLUDES • HIGH SPEED AND CARBON
DRILLS • REAMERS • CUTTERS • TAPS AND DIES • SCREW PLATES • ARBORS • CHUCKS • COUNTERBORES • MANDRELS • TAPER PINS • SOCKETS • SLEEVES

MORSE

TWIST DRILL & MACHINE COMPANY
NEW BEDFORD . . . MASS., U. S. A.

New York Store: 130 Lafayette St. • Chicago Store: 570 W. Randolph St.

right hand, resulting in a shaft of extraordinary strength and readily flexible in all directions. Rubber reinforced



Section of Stanley Flexible Shaft Showing Construction

casing protects the shaft against injury and prevents marring the work. The speed and power of the grinder together with its compact design and construction adapt it for a wide range of grinding and polishing jobs.

Firth Braze-Rite Furnace

An electrically-operated hydrogen brazing furnace designed especially for the tipping of sintered carbide cutting tools is announced by the Firthite Division of the Firth-Sterling Steel Company, McKeesport, Pa. Known as the Firth Braze-Rite Furnace, it provides for a simplified and improved method of brazing carbide blanks to steel shanks insuring a positive, permanent braze. With this furnace, tools of a wide variety can be brazed in much less time than has heretofore been required since heat is localized at the end of the tool on which the carbide blank is to be mounted, eliminating the necessity of heating the entire shank.

The furnace is provided with two separate muffles, each of 2-in. capacity. These muffles are made of a high heat-resisting alloy, developed to withstand brazing temperatures and which, in turn, will offer exceptionally long life. Tools varying in size from small bits up to those having 1½-in. square shanks can be accommodated.

Either 110-220 volts A.C. or D.C. can be used for operation of the furnace. When A.C. is employed a tap transformer is supplied and when D.C. is used the control is through a rheostat. A direct-reading pyrometer is mounted at the rear of the furnace which enables the temperature to be noted at all times. Through the electrical control and pyrometer reading it is possible to maintain a correct temperature at all times.

The furnace can be brought up to brazing temperature in a very few minutes so that little time is lost before

NEW
TAPPING ATTACHMENT
WITH THE NEW
"TRU-GRIP" TAP HOLDER
Now a finer high speed tapping attachment is available for your drill press. The new "Procunier" Style "E" tapper has the new "TRU-GRIP" tap holder, the latest improvement for high speed tapping. Smallest and lightest of its kind, ground for greatest accuracy, sturdy, easy to operate. Send for new literature.
PROCUNIER
SAFETY CHUCK COMPANY
12 So. Clinton St. Chicago, U. S. A.

WE ASK YOU--

Are your roughing inserted tooth face mills designed for **maximum blade life?**

They would be if you were using

GD & GD

inside cone type design.

The adjustment is positive and uniform, making it unnecessary to scale each blade as it is set out, as well as being in the direction to compensate for major blade wear.

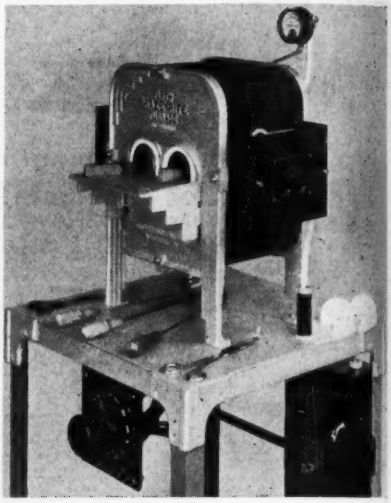
THINK IT OVER

GODDARD & GODDARD CO.

DETROIT, MICH.

actual brazing can be undertaken. On the other hand, when the furnace is to be shut down it is not necessary to make gradual current reductions as with former type hydrogen furnaces. This feature makes the furnace exceptionally suited for the brazing of small quantities of tools, in addition to continuous operation for larger quantities.

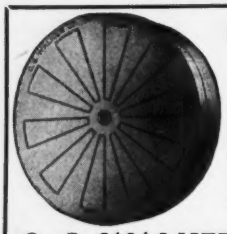
Brazing is carried out in a hydrogen atmosphere to prevent oxidation of the carbide tip and shanks, as well as the brazing material. Hydrogen is admitted through openings at the rear of each muffle. The amount of hydrogen is controlled by valves located at the rear of the furnace. A manifold is provided for connection of the hydrogen supply.



Firth "Braze-Rite" Furnace for Tipping Sintered Carbide Cutting Tools

Tool brazing is accomplished by covering the recess of the tool to be tipped with flux, then inserting the shank into the chamber until it has become preheated. It is then withdrawn so that the sintered carbide blank and copper can be set into place, after which it is inserted again, where it remains until the copper has melted. The tool then is withdrawn slightly so that the tip can be firmly pressed into position. This method assures brazing with a solid bond and eliminates possible damage as a result of poor brazing.

Economical operation of the furnace is an outstanding feature since very little current is required to maintain a



MAGNETIC CHUCKS

Highest Quality. All Sizes—For All Types Of Work. A Complete Line Of Rotary, Rectangular and Swivelling Magnetic Chucks.

35 *Years Experience*

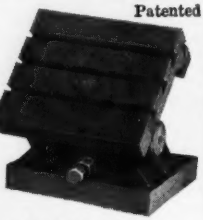
Write for catalog and price list No. 11.

O. S. WALKER CO., INC.

WOBURN AVE. WORCESTER, MASS.

ADJUSTABLE Angle Plate Patented

This plate will save time and provide a more accurate job in every tool room. Steel parts are hardened and ground. Can be adjusted to any angle and positively locked in position. Sold on complete satisfaction basis.



PRICE $12.00

FRANK McMAHON CO.

800 Smithville Road Dayton, Ohio

NEW! MODERN! Atlas METAL WORKING LATHES

HAS: automatically reversible power feeds. Built in counter shaft and motor bracket. 10" swing. Takes 18" between centers. Attachments available for all lathe operations. Accuracy guaranteed to within .001. Write TODAY for complete catalog of lathes, arbor presses, drill presses, tools and attachments. Before buying a small lathe, it will pay you to investigate the NEW ATLAS.

Atlas Press Co., 646 No. Pitcher St., Kalamazoo, Mich.

Advertisement Published in 1922

How the Rivitz Company Cut Hauling Costs 75%

Every dollar cut from the cost of doing business adds a dollar to the profit side. The Rivitz Company, one of the largest plumbing supply houses in the country, operates a Stuebing Lift Truck System.

General Superintendent Schmidt says: "We use Stuebing trucks almost exclusively in moving the 1200 tons of enamel and china-ware, fittings and soil pipe which pass through our plant each month. Our figures show the Stuebing System gives us a 75% saving over the cost of our former method. It also prevents the damage to goods caused by repeated stacking and unstacking on common trucks."

In all lines of business Stuebing Lift Truck Systems, used with inexpensive load platforms, are producing equally vital savings. Stuebing trucks are easy to lift, easy to pull, and will handle any type of product. They are built throughout of steel and are fitted with smooth-running roller bearings. Most owners say the upkeep cost with Stuebings is too slight to count. If you want better and cheaper interior hauling call in one of the Stuebing engineers located near you. His advisory services are at your disposal without obligation.

The Stuebing Truck Co., Cincinnati, O.

StueBing LIFT TRUCK SYSTEMS

HOW THE RIVITZ COMPANY CUT HAULING COSTS 75%

TODAY

THOUSANDS REPORT TREMENDOUS SAVINGS

Fourteen years ago, a statement like that made by the Rivitz Company was vitally important news to industry

Today it is just as important—but reports of such huge savings are common because the use of Yale (Stuebing Cowan) Trucks has been vastly multiplied throughout the industrial world.

WHY? Because this modern equipment DOES save many thousands of dollars for users by their speed, efficiency, safety and amazing durability in lifting and hauling all types of materials.

The evidence is overwhelming. It is FACT, not theory; ACTUAL EXPERIENCE, not mere conjecture. In every field of industry, stories of Yale performance are everyday news.

Yale Trucks can save YOU money. We are ready to prove this to you beyond question by the experience of your own industrial neighbors.

TRADE YALE MARK

5c a Month Upkeep for 51 Trucks

That is the maintenance cost reported by one user over a 2-year period Yale Trucks stand the gaff! Year in, year out, they handle capacity loads without flinching. Steel constructed, precision built, exclusive features provide easy roll, easy lift, years of constant service.

Write today to

THE YALE & TOWNE MFG. CO.

Philadelphia Division
Philadelphia, Penna., U. S. A.

correct brazing temperature. A single tank of oxygen will provide for several days' operation under normal use. The muffles, which can be quickly interchanged, will offer several hundred hours' life under ordinary conditions. The heating elements, likewise, will provide exceptionally long use.

Complete tools required for brazing are furnished, including tongs, shears, scraper and tip presser. In addition, a quantity of Firth Braze-Rite flux and copper is supplied, suitable for the brazing of a large quantity of tools.

A metal-top table is furnished optionally, although the furnace can be mounted on a bench if so desired. The table when furnished measures 21x21 in., and is arranged for connection of all electrical equipment, including a switch box.

Oliver 18-In. Metal Cutting Band Saw

Sheet steel, rods, metal tubing, compositions, hard rubber, wood and other materials can be cut accurately and economically with the Oliver 18-In. Metal Cutting Band Saw which is now being made by Oliver Machinery Company, Grand Rapids, Mich. The saw is a self-contained, portable machine, regularly fitted with a motor-on-shaft, cord and switch, ready for use.

A special feature of the machine is the exceptionally large cast iron table with miter cut-off gage and parallel cutting fence which decidedly increases the usefulness of the machine. The machine takes 18 in. between the saw and the column, is 9 in. high under the upper guide, and can use saws up to ½-in. wide. With gages, parallel cuts can be taken up to 11 in. wide and the machine will cut off and miter up to 6½ in. The table can be tilted 45 deg. to the right. The table, which is 24 in. wide by 20 in. long, is well ribbed and accurately machined. The height from the base is 20 in. and height from the floor when supported on a floor base is 38 inches.

The wheels are of cast iron, 18-in. diameter with 1¼-in. face, covered with rubber. The wheels are mounted in ball bearings and run at a speed of 1800 r.p.m. The upper wheel has 4 in. vertical adjustment. Both wheels are completely guarded. The lower wheel has positive non-changing alignment with the frame of the machine.

Frictionless ball bearing guides are

GEAR NOISE ..... Causes and Corrections

Paper Presented *at the* Twentieth Annual Meeting *of the* American Gear Manufacturers Assn. *by* W. E. Sykes

In this informative paper the author explains the difference between *noise* and *sound*, states the causes of gear noise and analyses the requirements of design, workmanship, lubrication and other factors that must be met to prevent or overcome noise.

The author has had over a quarter of a century of experience in the design, manufacture and operation of gearing and for a number of years has given much study to the subject discussed in the paper.

We have a small quantity of this paper and as long as our supply lasts we shall be glad to send a copy free to those who request it on their company letterhead.

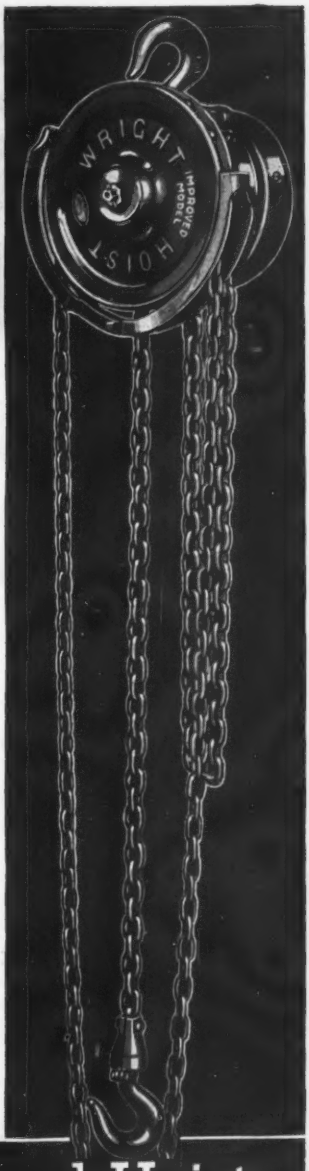
FARREL-BIRMINGHAM COMPANY, INC.
381 Vulcan St., Buffalo, N. Y.

ZINC-COATED FINISH . . .

SAFETY LOAD CHAIN GUARD

PRECISION LOAD WHEEL BEARINGS . . . .

BALL BEARINGS IN DRIVE SPINDLE BEARING



these 4 features are exclusive with the WRIGHT Hoist.

Intelligent buyers—buyers who buy industrial equipment point by point and feature by feature—cannot help but choose the RIGHT Hoist if they decide upon the Wright.

Because, in addition to these four exclusive features, there are seventeen more—a total of 21 points of superiority.

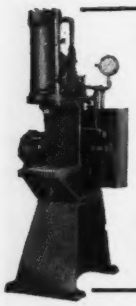
What more could a careful buyer ask?

WRIGHT MANUFACTURING DIVISION OF THE AMERICAN CHAIN CO., Inc.
York, Pennsylvania

In Business for Your Safety

ACCO

WRIGHT *Improved* High Speed Hoists



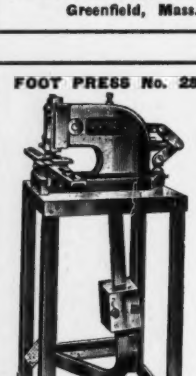
Greenerd Arbor Presses

HYDRAULIC
HAND OPERATED
MOTOR DRIVEN

Greenerd Arbor Presses
NASHUA, N. H.

Standard or Special
KEYWAYS
With
YOUR ARBOR PRESS
Write for Circular
TAPS AND DIES
for all requirements
Threadwell Tap & Die Co.
Greenfield, Mass.

FOOT PRESS No. 25



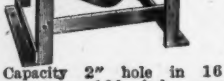
Capacity 2" hole in 16 gauge — 100 holes per minute.

ANGLE IRON SHEAR No. 4

Capacity 2x2x¼" Angle Iron
Weight 44 lbs.

ASK FOR CATALOG No. 9

No. 10 PUNCH

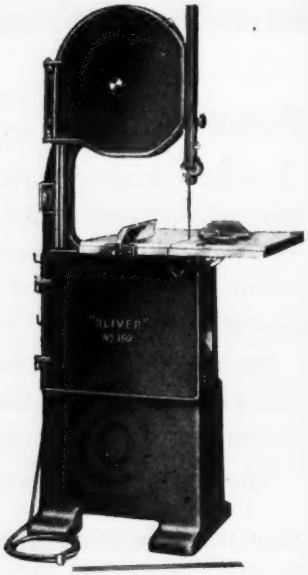


Capacity ⅜" hole through ¼" iron. Weight 8¼ lbs.

80 ITEMS FROM WHICH TO CHOOSE

WHITNEY METAL TOOL CO.
91 FORBES ST. ROCKFORD, ILL.

furnished both below and above the table. These guides have only four major parts. The saw runs against the outer edge of a hardened wheel which revolves against a ball bearing. Hardened steel side guides or li[illegible] prevent turning of the saw sidewise. Two gages are regularly furnished for use on the table — an angle cutting gage and a parallel cutting gage. The angle cutting gage slides in a groove in the table, is fully graduated and clamps at all useful angles to the saw. The parallel cutting gage clamps against the front end of the table in a grooved way at either side of the saw.



Oliver 18-In. Metal Cutting Band Saw

The motor is 1 h.p., 1800 r.p.m., totally enclosed and fitted with ball bearings. It will operate on either A.C. or D.C. 110 or 220 volts. The motor is built into the machine, eliminating all unnecessary power transmission parts. Blades up to ½-in. widths for metal cutting saws can be supplied. Each machine comes equipped with one saw blade ⅜-in. wide, one parallel cutting gage, one angle cutting gage and one filing strip for the table groove. Floor space required, 23x33 inches.

Without investing a Dollar!

...7 out of 10 can Modernize metal and plastic Assemblies

—to win economies and benefits like these

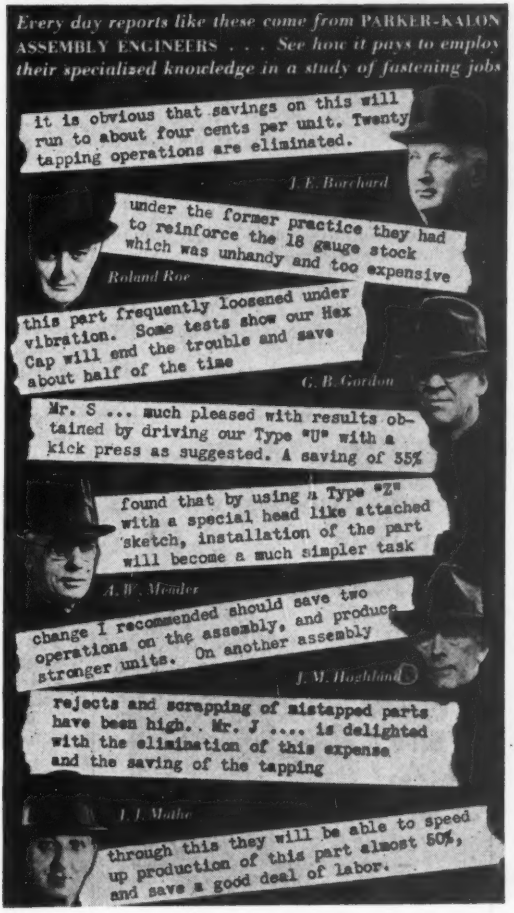
MODERNIZATION usually implies an investment in equipment or costly changes in method. But in one of the most important plant functions . . . *Assembly Work* . . . it can be carried out with profit by 7 out of 10 concerns that assemble metal or plastics, *without investing a dollar.*

Proof of this is found in the results obtained by hundreds of plants. In 7 out of 10 cases where Parker-Kalon Assembly Engineers have been invited to investigate opportunities for applying Hardened Self-tapping Screws, assembly work has been improved without expense or radical change. Fastening jobs were speeded-up, made easier and cheaper . . . assemblies were strengthened . . . new possibilities for design simplification and product improvement were opened-up, merely by substituting Hardened Self-tapping Screws for more complicated and costly methods.

Your own assembly work may hold many hidden or overlooked opportunities for improvement which could be uncovered by employing the specialized knowledge of a Parker-Kalon Assembly Engineer. It costs nothing to have him go over your fastenings with you. Further, you will not be "pestered" for he is a practical man whose sole function is service. He does no selling. Write us and a visit to your plant will be scheduled.

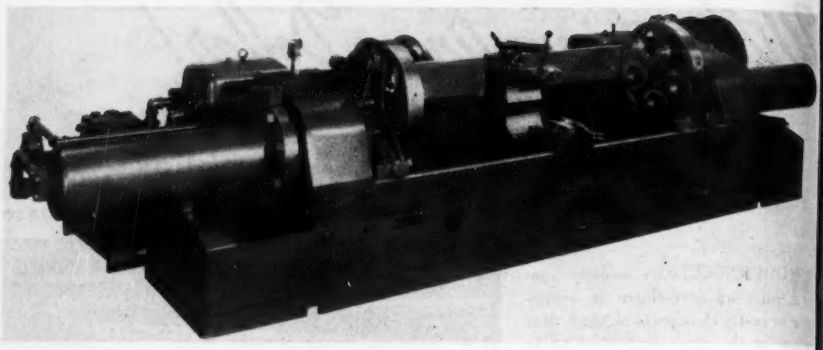
PARKER-KALON CORPORATION
Dept. M, 198 Varick Street, New York, N. Y.

Every day reports like these come from PARKER-KALON ASSEMBLY ENGINEERS . . . *See how it pays to employ their specialized knowledge in a study of fastening jobs*


it is obvious that savings on this will run to about four cents per unit. Twenty tapping operations are eliminated.
J. E. Borchard
under the former practice they had to reinforce the 18 gauge stock which was unhandy and too expensive
Roland Roe
this part frequently loosened under vibration. Some tests show our Hex Cap will end the trouble and save about half of the time
C. B. Gordon
Mr. S ... much pleased with results obtained by driving our Type "U" with a kick press as suggested. A saving of 35%
found that by using a Type "Z" with a special head like attached sketch, installation of the part will become a much simpler task
A. W. Mosher
change I recommended should save two operations on the assembly, and produce stronger units. On another assembly
J. M. Highland
rejects and scrapping of mistapped parts have been high.. Mr. J .... is delighted with the elimination of this expense and the saving of the tapping
J. J. Mathe
through this they will be able to speed up production of this part almost 50%, and save a good deal of labor.

PARKER-KALON *Modern* FASTENING DEVICES

A HARDENED SELF TAPPING SCREW FOR EVERY KIND OF ASSEMBLY



Oilgear 100 Ton Horizontal Swaging Press

Oilgear 100-Ton Horizontal Swaging Press

Both ends of large steel truck housing tubes are cold swaged simultaneously from 6-in. to 4-in. diameter in five passes on the 100 ton horizontal press illustrated herewith. The press is a product of The Oilgear Company, 1405 W. Bruce St., Milwaukee, Wis.

The housing tube is located and manually clamped in the center fixture which is stationary. Dies in the two opposing five-station rotary type supports are moved forward by the crossheads, swaging both ends of the tube simultaneously. Each die support is indexed manually and independently of the other, the lower die being on the centerline of the cylinder ram and in position for the swaging operation. A single hand lever at the front of the press controls the speed and direction of movement of both crossheads.

Each crosshead and piston is powered by a separate Oilgear Type DH-60 Variable Delivery Pump mounted on an independent base and direct-connected to a 50 h.p., 860 r.p.m. electric motor. The press base is of one-piece welded steel structure and supports two cylinders, yokes, crossheads, tie bars and center clamping fixture. Two large rectangular steel die bars bolted to the yoke carry the tension load of the opposing rams. Each cylinder is double acting and the rams are guided in large bronze liners. The crossheads and five-station rotary type die supports are carried on rollers which ride on the die bars.

The capacity of each cylinder is 1[illegible] tons and the stroke of each piston 40 in. Distance between die blocks, [illegible] in. Maximum pushing speed, 135 in. per minute. Maximum return speed, 300 [illegible] per minute. Net weight, press and pumps, 32,000 pounds.

Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER will do the job so much quicker and better?

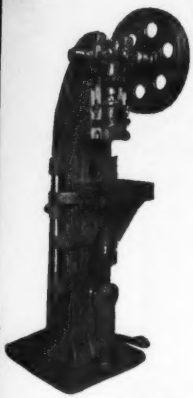
Send for circular

DAVIS KEYSEATER CO.
Exchange & Glasgow Sts.
ROCHESTER, N. Y.

Barrett Electric Elevator

The Barrett Electric Elevator, which has been brought out by Barrett-Cravens Company, 3255 W. 30th St., Chicago, Ill., has many interesting features of design. The elevator is made in capacities ranging from 500 to 5,000 lbs. and

HORN PRESSES

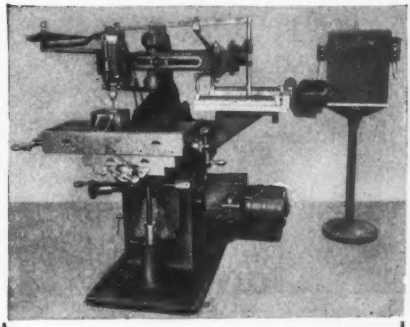


- One of many Standards
- Up-to-date Design
- Best Material and Workmanship

Manufactured by

Zeh & Hahnemann Co.

184 Vanderpool St. Newark, N. J.



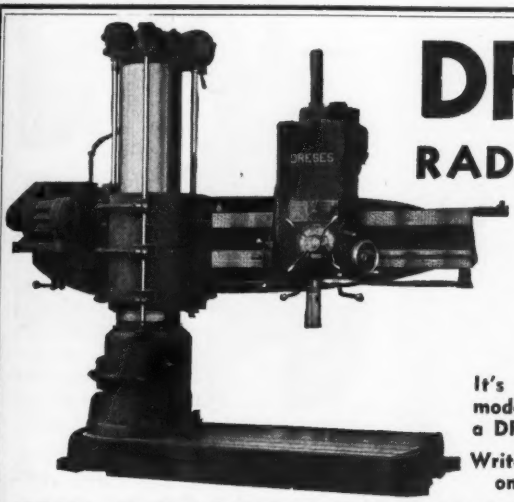
Marquette Three Dimensional Universal Engraving Machine

This new Diesinking and Profiling machine is specially designed for quickly and accurately cutting dies and molds in third dimensional direction as well as flat work, design pieces, lettering, profiling, etc. All motions are automatically controlled — also semi-automatic if desired.

Write for full details.

Marquette Mechanical Eng. Co.

16 W. 5th St. Erie, Penna.



DRESES

RADIAL DRILLS

Provide

- POWER
- SPEED
- ACCURACY
- LOW COST

It's a paying investment to modernize your plant now with a DRESES RADIAL DRILL.

Write today for full information on these advanced tools.

THE DRESES MACHINE TOOL CO.

CINCINNATI, OHIO

RIVETING?

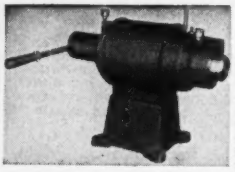
LINLEY NOISELESS ROTARY RIVETING MACHINES

Assure Peak Production and Lower Maintenance. Rigid and Powerful. Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

LINLEY BROTHERS CO.
583 Fairfield Avenue
Bridgeport, Conn., U. S. A.

IDEAL SPEED LATHES



FOR LAPPING FINISHING POLISHING SMALL PARTS

2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Cir. 351.

SCHAUER MACHINE CO.
905-7 Broadway Cincinnati, Ohio

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

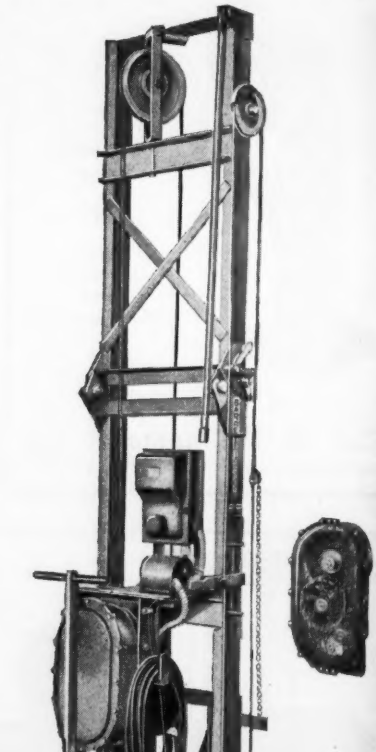
Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four Chilled iron discs rotate on sensitive special bearings

Write for Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

in any piling height and size of platform. The electric elevator provides an ideal means of raising materials from one level to another, for handling jigs and dies from store room shelves to



Barrett Electric Elevator

machine tables and vice versa, and for piling material in the store room.

The elevator is powered by a direct motor drive, cable and switch being provided so that power can be obtained from any convenient electrical outlet. The switch is of the thermal overload

Productimeters

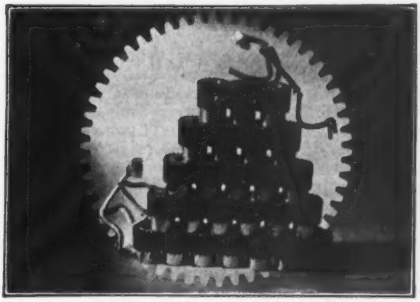
Count Production at the source on

● Punch presses ● Drill presses ● Screw machines ● Turret lathes and other production machine tools. Save cost of hand counting with industries' preferred counters. Send for bulletins of Productimeters designed for your machines.

DURANT MFG. CO.

1932 N. Buffum St. Milwaukee, Wis. 173 Eddy St. Providence, R. I.

TELL US WHAT YOU WANT TO COUNT



"They Live on the Job"

Mass. Gears

Build accuracy into your apparatus

All Types and Materials

Massachusetts Gear & Tool Co.
27 Nashua St., Woburn, Mass.

The experienced die worker prefers a

HASKINS HS-4

because it is sensitive . . . vibrationless . . . full powered. And it does the job accurately and quickly.

This machine and many others are described in our new catalog—a 40-page booklet that tells how Haskins Flexible Shaft Equipments—both light and heavy duty—are used in the various industries. WRITE FOR THIS BOOKLET TODAY.

R. G. HASKINS COMPANY

4665 W. Fulton St. Chicago

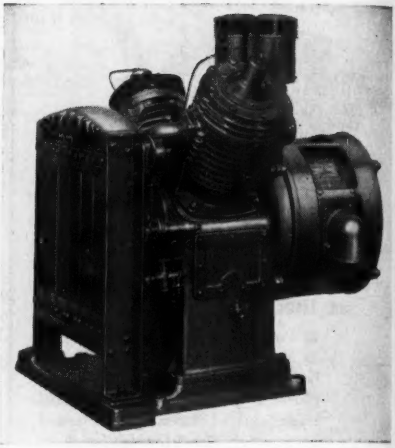
European Rep.—Marbaix, Ltd. Vincent House, London, S. W. 1.

type and an electric solenoid brake is integral with the motor. Transmission gears are of the cut spur type, fully enclosed and running in oil, and the cable runs over a grooved cable drum. Top and bottom limit switches are provided, also cable control. The floor wheels, sheaves, and platform rollers are equipped with Hyatt roller bearings. Three point suspension of the hoist provides floating power.

Sullivan Unitair Compressor

A two-stage completely air cooled V type single acting stationary air compressor incorporating many advanced features in compressor design, to be known as the "Unitair", has been placed on the market by Sullivan Machinery Co., Dept. 21, Michigan City, Ind.

The Unitair is so designed that it can be installed in a minimum of time and does not require any extensive foundation to work efficiently. Unitair is intended to deliver 24-hour service where such service may be necessary. Microlift valves and a ball bearing crankshaft are said to make this unit the outstanding compressor development of the year. The Unitair is available in four sizes to 400 cu. ft. per minute displacement and for any kind of drive. It can be equipped with a built-in electric motor, have direct connection or V-belt drive from a motor, gasoline engine of Diesel power unit. Catalog No. 88-O gives full details.



Sullivan Unitair Compressor

THIS COMPLETE "GUSHER" Pumping Unit

can supply coolant on machines not originally equipped with a pump or reservoir. Merely a distributing and a return line need be provided to make the installation. Available for any current characteristics . . . power circuit or light socket plug-in. Heavy duty casters are optional on tank.

Tank units are equipped with the famous "GUSHER" Model UL Pump . . . noted for its simplicity and efficiency . . . its elimination of all packing glands or their equivalent . . . and many other original and exclusive features.

Model U L

Write for full data on any of the pumps in the complete RUTHMAN line.

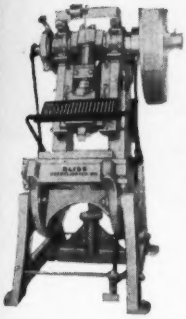
The Ruthman Machinery Co.

536 E. Front St., Cincinnati, Ohio

GUARD PRESSES!

with

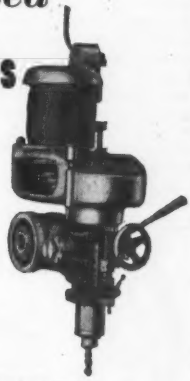
Junkin Safety Guards



TRIPLE INTER-LOCK keeps presses locked until guard is safe. JUNKIN Guards operate on any kind of press . . . speed up work . . . are easy to install. A single injury can be more expensive than many guards. *Write now for full facts.*

Junkin Safety Appliance Co., Inc.
930 W. Hill St., Louisville, Ky.

PRECISION BUILT
High Speed
MILLING ATTACHMENTS



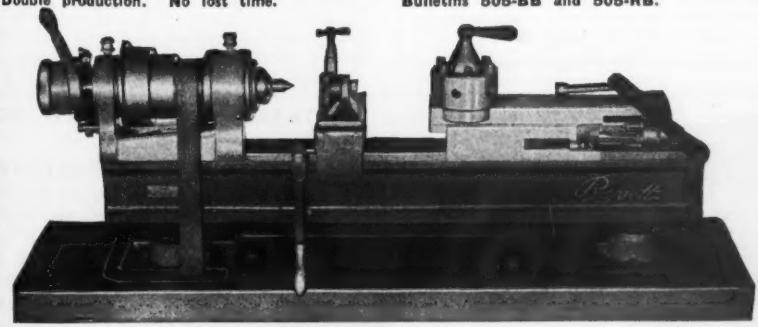
The versatility, productive capacity and economy of Bridgeport High Speed Milling Attachments enable them to pay for themselves in a very short time. In use in both small and large plants throughout the United States and Canada. An investment you will be glad you made. Adapters available for all types of machines.

Write for complete details and prices.

BRIDGEPORT PATTERN & MODEL WORKS
52 REMER STREET
BRIDGEPORT CONN.

RIVETT ANTI-FRICTION SPINDLE BENCH LATHES
BALL BEARING AND ROLLER BEARING

The earning power of an anti-friction bearing lathe with Speed Box Drive may well be twice, or three times that of an old type counter or jackshaft driven job.
Spindle is trouble-proof under all conditions.
Speeds are: Ball bearing, maximum 4600 R.P.M.
Roller bearing, maximum 2300 R.P.M.
Endless belt is replaceable in one minute.
Motor runs continuously.
Speed Box gearing and multi-steel disc clutch are splash lubricated.
Brake is automatic and stops spindle instantly.
Lever Chuck Closer has hardened steel rollers to withstand severe continuous duty.
Double production. No lost time. Bulletins 505-BB and 505-RB.

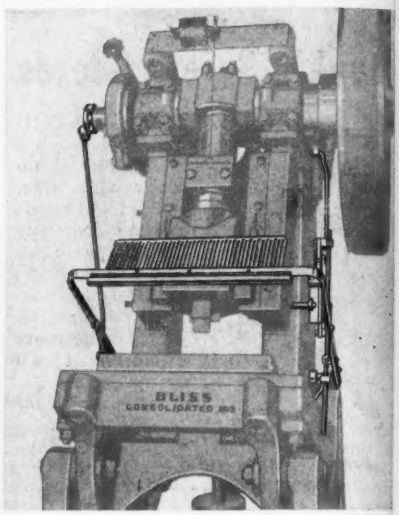


RIVETT LATHE & GRINDER INC. BRIGHTON, BOSTON, MASS.

Junkin Safety Appliances

Developed for the purpose of eliminating accidents in its own custom stamping plant, the Junkin Safety Appliance Company, 932 West Hill St., Louisville, Ky., has placed on the market a line of safety appliances, to be known as Junkin Non-Repeat Triple Interlock Safety Guards, for use on stamping presses. The guard is so designed that the human element is entirely removed and the operator's hands must necessarily be out of the danger zone before the press can be operated.

The guard, which is made in several different designs according to the size or type of the press, is attached to the press so that access to the safety zone must be blocked before the press can be operated. The guard can be used on any type of press, single or double, and both front and back on the larger presses where two operators are required. Each man is provided with a pair of interlocking handles which must be pressed down and held in that position before the press can be tripped by the pedal. If either the pedal or starting lever is not fully depressed, the press can not operate. When the operators' hands are occupied in depressing the handles, the press can be started and will then make but one stroke until the handles and



Junkin Safety Guard for Punch Presses

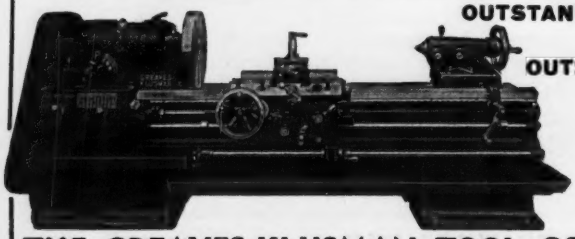
FROM STOCK

Bond GEARS

SPROCKETS
SPEED REDUCERS
FLEXIBLE COUPLINGS
Ask for Catalog

CHARLES Bond COMPANY
617-623 ARCH ST., PHILADELPHIA, PA.

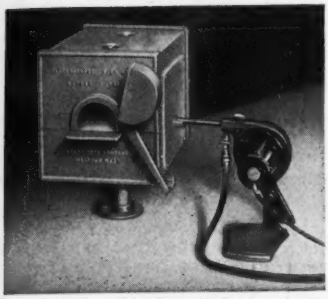
DRILL THESE HOLES
By a Quick, Easy, Inexpensive Method
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Pa.



OUTSTANDING PERFORMANCE
provided by
OUTSTANDING FEATURES
G. K. Single Lever Control Lathes will give you the production efficiency you want on your lathe work. Write for catalog describing complete details.
THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

"Stark"

"ELECTROBLAST"
High Speed Heat in 20 Minutes



Powerful torch used separately as a very handy portable flame, $35. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3⅛"x2⅛". $35. Also a larger furnace with built-in torch, muffles 7"x4⅝"x3½".

STARK TOOL CO.
Originators of the American Bench Lathe
Est. 1862 WALTHAM, MASS.

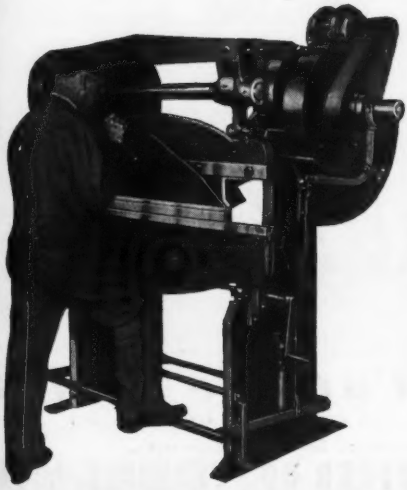
4 Holes at Once
With a
U. S. Multiple
Drill Head

● You can save money and time with U. S. Multiple Drill Heads, standard or special according to the job.
This head is for drilling 4 holes at once . . . with other U. S. heads as many as 50 holes can be drilled at one time.

Send blue prints for estimates.

The United States Drill Head Co.
1954 Riverside Drive
CINCINNATI, OHIO

THIS No. 253 CHICAGO STEEL PRESS



Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

Write for Circular No. 253

DREIS & KRUMP MFG. COMPANY
7418 LOOMIS BLVD.
CHICAGO ILLINOIS

pedal have been released and depressed again.

When the press is not operating there is nothing to interfere with the placing of dies or work in the press, the working area being unobstructed until the operator operates the machine by depressing both the handles and the foot pedal. If the operator has his hand in the way so that the guard is prevented from dropping all the way down, the pedal will remain locked and the press can not be tripped. An added safety feature consists in that breakage of the locking or pedal spring will instantly set the guard in safe position.

With the Junkin Guard the operation of the guard is always 180 degrees ahead of the ram. The guard must be all the way down before the ram can start, and does not start up until the ram is at the bottom center. Guards of this type are in operation on presses operating at speeds as high as 140 r.p.m. The entire Locking mechanism is enclosed, making it impossible for the operators to tamper with the safety mechanism.

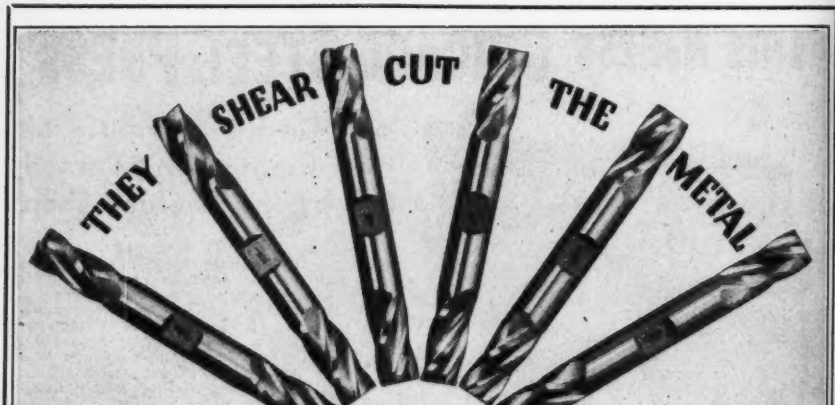
Weldmaster Ultra-Light Weight Welding Torch

The illustration shows the Weldmaster Ultra-Light Weight Welding Torch which has been placed on the market by the Modern Engineering Company, 3411 Pine Bldg., St. Louis, Mo. This torch weighs, with a standard tip, only 17½ ounces and is claimed by the manufacturer to be the lightest weight torch on the

Weldmaster Ultra-Light Weight Welding Torch

market. A new alloy that can be forged, extruded, and heat treated, and has the tensile strength of mild steel is used in the construction of the torch. The torch is said to be perfectly balanced as a result of weight elimination, making it possible for the operator to manipulate it with maximum flexibility and minimum effort.

The circle mixer employed in all "Meco" torches has been improved and its capacity increased. Even the largest tips may be used efficiently with low gas



They Shear Cut the Metal

That's why they cut faster and leave that smooth finish. It's the way they are ground that brings results.

Send for a new catalog showing single, double, and other styles.

PROGRESSIVE TOOL & CUTTER CO., FERNDALE, MICH.

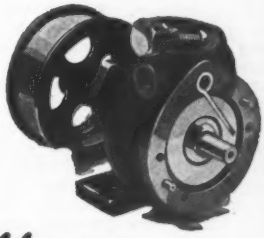
NEAT STAMPING IN NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

Write For Particulars

GEO. T. SCHMIDT, Inc.

1806 Belle Plaine Ave., Chicago, Ill.



Rollway ROLLS!

The motion in this non-clogging coolant and lubricant pump is always **rolling.** No scraping of working parts against pump chamber. Wear reduced to a minimum.

ENGINEERING DATA SHEET

Ask for Data Sheet for your files, describing reversing and non-reversing models, with or without automatic built-in relief valve.

PIONEER

ENGINEERING & MFG. CO.

33 Melborn Ave. Detroit, Michigan

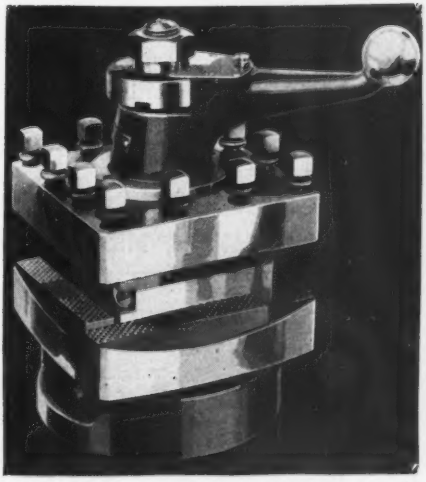
Also Centrifugal and Hydraulic Pumps

SPEED UP with McCROSKY TURRETS

for Engine Lathes

• Permit successive operations to be performed with no time out for changing tools. Rigid tool support. Positive and accurate indexing. Made in 6 styles, square and hexagon, with 3 or more sizes in each style.

• To determine size and style for your lathe send for Bulletin 14-E.



McCrosky Square Turret to bolt to bolt circle. One of 6 styles that all cut costs.

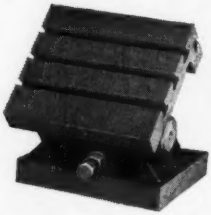
McCrosky Tool Corporation, Meadville, Pa.

pressures, as when working from acetylene generators. A new method of boring passages to rifle smoothness has been developed which provides for ideal flame characteristics under any operating circumstances in the full range of welding practice.

Other features of the Meco Weldmaster include spring tension equipped wheel handles which assure permanent adjustments even with rough handling and bumping of the torch, wheel handles with fluted design and thin grip with wide fluting, and blue finished grip with balance of handle a contrasting silver type alloy. The Weldmaster Torch is made in two types; the Standard and the Super.

McMahon Adjustable Angle Plate

The illustration shows an adjustable angle plate which is now being marketed by Frank McMahon Company, 800 Smithville Rd., Dayton, Ohio. The feature of the plate consists in that it can be adjusted to any angle and locked in position with a positive lock. Both the base and surface plates are of gray iron which has been machined, annealed, and then finished to eliminate the possibility of release of strains and distortion after finishing. The adjusting bolt hole is ground true with the surface of the plate.



McMahon Adjustable Angle Plate

The plate is made in three models, the size of the Model A and Model B plates being 3½x3½ in. square. Model A has four ⅜-in. T-slots, three on the face and one at the top of the locating plate as shown in the illustration, and Model B is the same as Model A except that it has no T-slots. The Model D plate is approximately 6x6 in. square and weighs 50 lbs. The Model D plate is not made with T-slots but has twelve ⅜-in. x 16 thread tap holes in the face side and four at the top.

UNIVERSAL
COLLET CHUCKS
GRIP AS STRONG AS SOLID STEEL
CONCENTRIC WITHIN .001
FOR END MILLS KEY WAY CUTTERS AND NITRIDED CENTER POINTS
UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICH.

. . . for more than 1001 odd jobs

The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 Beacon St., Woburn, Mass.

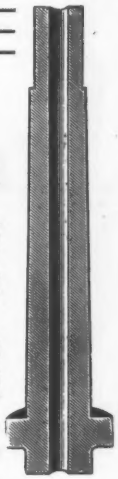
• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with **ALEMITE LUBRICATION**, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER
WALLS SALES CORP.
96 WARREN ST. NEW YORK, N. Y.



Made by SPECIALISTS

Manufacturers everywhere specify American Hollow Bored Forgings because they are made by specialists . . . men who know real accuracy . . . and because the price is right.

It is good business to investigate American Hollow Bored Shafts and Forgings for your needs. Send us your blueprints. Data and prices will be furnished without obligation.

AMERICAN
HOLLOW BORING CO.
2000 Raspberry St.
Erie, Pennsylvania

Grinds 81 SIZES OF Drills

No. 31 to ½"

This Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes and increases production.

Write for descriptive folder.

STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

BLOOMFIELD AVE. BLOOMFIELD NEW JERSEY

MODERN-EFFICIENT
CALCULAGRAPH

Automatically Records
"ELAPSED TIME",

THE ACTUAL WORKING TIME
ON JOBS OR OPERATIONS

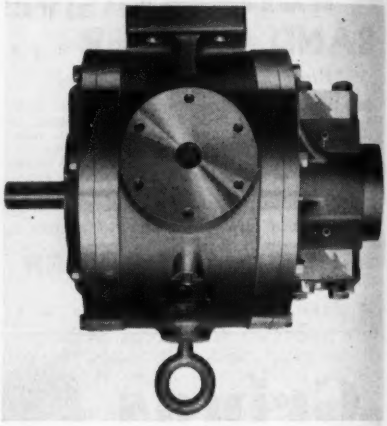
CALCULAGRAPH quickly shows exact processing time on men, and machines . . . Soon pays for itself through increased efficiency . . . Is absolutely foolproof . . . Sturdy, precision construction . . . Employs any style of card . . . Available with spring or electrical drive.

Write now for FREE BOOK
"ELAPSED TIME RECORDS"

CALCULAGRAPH CO.
52 CHURCH ST., NEW YORK, N. Y.

H-P-M Model 4R Radial Pump

The Model 4R Radial Pump now being offered to the trade by the Hydraulic Press Mfg. Company, Mt. Gilead, Ohio, is said to have several outstanding and distinct advantages of design and construction. These advantages have to do with a decided increase in radial pump operating efficiency, service, and dependability. The manufacturer states that the design of the Model 4R provides a mechanical relationship between the valve pintle and cylinder rotor which is



H-P-M Model 4R Radial Pump

definite and certain, positive positioning of these vital parts being assured. Thus an unbroken film of oil is maintained between these two vital parts, preventing metal-to-metal contact and casualties which might follow such contact.

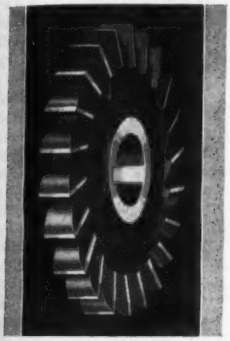
The Model 4R Pump is now standard pressure generating equipment for all H-P-M Hydro-Power Presses.

Mathews Roll-Over Device

The illustration shows a Roll-over Device which has been developed by Mathews Conveyer Company, Ellwood City, Pa., for incorporation into Mathews ball bearing roller conveyors. The device illustrated here was especially intended for reversing winding machine frames, but similar devices are used in the manufacture of a wide variety of heavy objects which are moved through the machine shop by means of conveyers.

The use of roll-over devices such as the one illustrated relieves the machine

MIDWEST
Milling Cutters



Side
Half-Side
Plain
Interlocking
Keyway
Angular
End Mills
Specials

● Fully described and listed on pages 39 to 59 Midwest Catalog No. 14-M. Send for a copy of this 64 page manual on milling cutters and end cutting tools.

Midwest Tool & Mfg. Co.
2358 W. Jefferson Ave. Detroit, Mich.

HY-TEN
ALLOY STEELS

Write for free copy of Steel User's Data Sheets, containing valuable information on the use and treatment of special steels.

Wheelock, Lovejoy & Co., Inc.
130 Sidney St. Cambridge, Mass.
CLEVELAND CHICAGO NEWARK
DETROIT BUFFALO

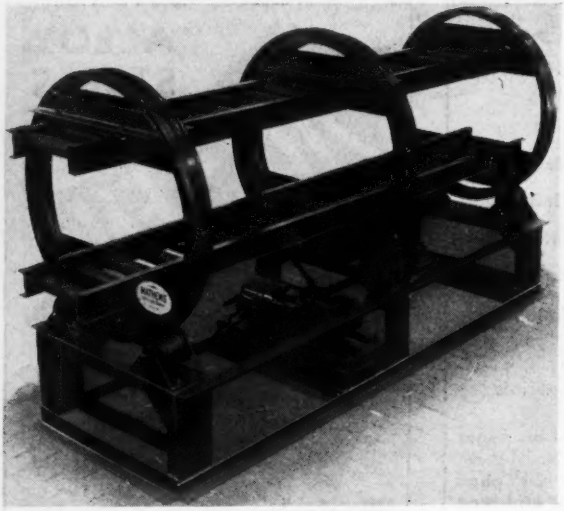
ENGINEERED FOR EFFICIENCY
POWERED FOR PERFORMANCE

Because HERCULES PORTABLE TOOLS are *production* tools they are engineered and built for efficiency and endurance. They must function economically, speedily—and they must have *brawn* to stand the pace. They *do* and *have!* . . . That's why they are in use in all the great American industries, and in thousands of other shops practically the world over.

A COMPLETE line of Grinders, Sanders, Buffers, Drills, Nut Runners and Screwdrivers in BOTH PNEUMATIC and HIGH FREQUENCY ELECTRIC types.

Illustrated—top, No. 300 Series General Purpose Pneumatic Grinder; bottom, No. 21D high speed High Frequency Electric Drill.

THE BUCKEYE PORTABLE TOOL CO.
DAYTON, OHIO
HERCULES



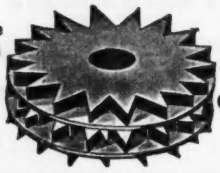
Mathews Roll-over Device for Reversing Heavy Workpieces

operator from the difficult and more or less dangerous job of reversing heavy workpieces, simplifies his task and to a large extent eliminates non-productive time. The device is power operated, power being supplied by a Master electric motor which is thoroughly protected against dirt and chips.

Power is conveyed from the motor to the device by means of a chain running on a sprocket on the power unit and sprocket teeth which are cut in the central ring of the Roll-over Device. The travel is controlled by electric limit switches, 10 seconds being required to revolve the load 180 deg. The Roll-over operates on ball bearings.

The device is of solid and substantial construction, the cross members which support the roller conveyor section being welded to the rings. The base is also of welded construction, the cross sections and longitudinal sections, together with

THE COMTOR SYSTEM
PRECISION
MEASURING GAGES
Internal
External
We also SPECIALIZE in
Unusual Gaging Problems
Write us.
THE COMTOR CO.
WALTHAM, MASS.

Grinding Wheel Dressers
We make all types of Dressers and Cutters

Write for Catalog "M"
DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

BETTER Tool Chests!

Better, finer, more desirable than ever. GERSTNER Tool Chests always please the most particular machinist, tool, die or pattern maker.
See them at your Dealer's. Order direct if he does not carry them.
Free Catalog.
GERSTNER TOOL CHESTS
1254 Columbia St. Dayton, Ohio

1905 **Strand** 1936

FLEXIBLE SHAFTS
and
MACHINES

TYPE VC

QUALITY EQUIPMENT ONLY

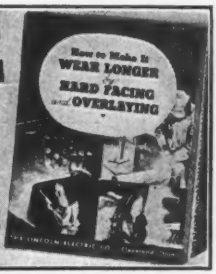
Our new Vertical Type Three - Speed Machines are furnished in 1/6, 1/4, 1/3 H.P. Speeds 1725 to 10,400 R.P.M.

Send for Catalog

N. A. STRAND & CO.

5001 N. Lincoln St., Chicago, Ill.

FREE
A GUIDE TO LOWER SHOP COSTS



● You'll find all the answers to problems in refacing worn parts of machinery and equipment in this 16-page arc welding guide. Contains complete description of the proper procedures for welding to resist abrasion, impact, shock and corrosion. Suggests scores of new ways to use the electric arc profitably around the shop.

Send for a free copy today.

THE LINCOLN ELECTRIC COMPANY
Department E-216 **Cleveland, Ohio**
Largest Manufacturers of Arc Welding Equipment in the World

NEW LOW PRICE!

Same High Quality!
Same Cutting Speed!

The "Mighty Midget" Unishear — now at a price that brings it within the easy reach of everyone having sheet materials to cut. So much faster — so much better than hand cutting. Follows straight lines, curves or angles with hair-line accuracy.

"MIGHTY MIDGET", capacity 18 gauge hot rolled steel, other materials in proportion. Cutting speed as you feed up to 15 feet per minute. Ask your dealer for price and demonstration.

STANLEY ELECTRIC TOOL DIVISION
The Stanley Works - 137 Elm St., New Britain, Conn.

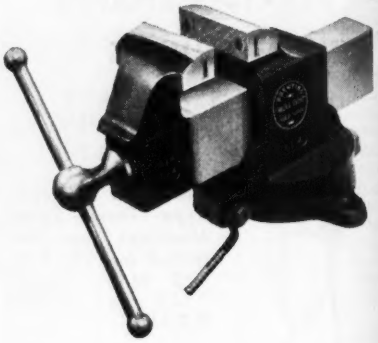
the gusset plates, being solidly welded together. The motor base is also welded in position. The unit illustrated is 10 ft. long and is designed to handle unit loads up to 1800 lbs. weight.

Prentiss "Bull Dog" Machinists' Vises

The line of "Bull Dog" vises marketed by Prentiss Vise Company, 302 Broadway, New York, N. Y., has been completely redesigned in order to effect a scientific distribution of the metal for greatest possible strength and convenience in use. Each size of vise is exactly proportioned in every dimension so that from the smallest to the largest of the line the vises are relatively identical. Special features are detachable and interchangeable alloy steel jaw faces, a main screw one piece cold rolled steel with forged head, and a lever with forged ball ends.

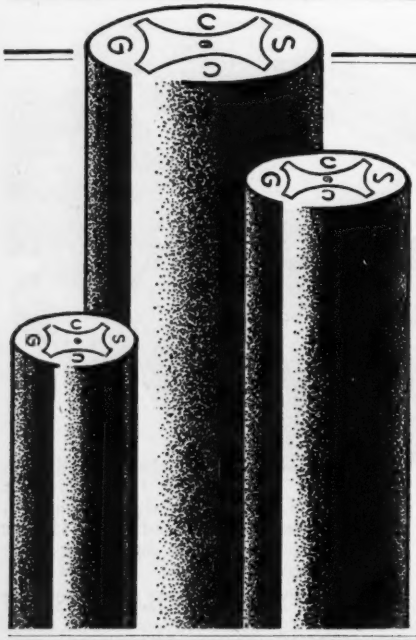
The new design includes a swivel base comprising a split ring squeezed against the hub on the vise body. The base is designed for the maximum of holding power and free action, and is easy to operate. A quarter turn on the lever will allow the vise to rotate freely through 360 deg., or will tighten it immovably.

All parts of the "Bull Dog" Vise are



Prentiss "Bull Dog" Machinists' Vise

finished to close tolerances providing accurate fits on all working parts and interchangeability. Vises are available with either stationary or swivel bases,



Cumberland Steel Shafts

—for Superior Finish and Absolute Accuracy

TOLERANCES

SPECIAL (Any Diameter)

LIMITS ± 0.0005"

or any other total tolerance of 0.001"

STANDARD

Small Dia. { +0.000" −0.002"

Large Dia. { +0.000" −0.003"

Send for Latest Bulletin

Cumberland Steel Co.

CUMBERLAND, MARYLAND

"86 Years in Business"

JK SMIT SONS

AMSTERDAM
LONDON
BAHIA
NEW YORK

• AIR WATER COOLED
DIAMOND HOLDER

MANUFACTURED BY
J.K. SMIT & SONS INC.
INDUSTRIAL DIAMOND IMPORTERS

Write for "DIAMONDS IN INDUSTRY"

NEW YORK
157 CHAMBERS ST.
DETROIT, MICH.
6400 TIREMAN AVE.

SUTTON

with
DIAMOND
SERRATIONS

● Catalog No. 12 lists single-piece, master-type and compensating Sutton DIAMOND GRIP Collets for leading makes of screw machines. Send for a copy.

SUTTON TOOL COMPANY
2838 W. Grand Blvd. Detroit, Mich.

"The Blade in the Plaid Box"

LENOX
HACK SAWS
BAND SAWS

Have YOU Investigated

the superior craftsmanship and economy of LENOX BLADES?

Order a box now. Note the improvement in your workmanship and efficiency.

THE
M-B "Super" Speed Air Grinder

Thrilling Speeds ● Operates on Air Pressures of 45-100 Pounds

Amazing Power ● Speeds of 35,000 to 100,000 R. P. M.

Weighs 8½ Ounces.

Revolutionary in Hand Air Grinder Performance. Write for Full Details.

Desirable Territory Open For Dealers

M-B PRODUCTS

GENERAL SALES OFFICE 130 E. LARNED ST., DETROIT, MICH.
Factory at Algonac, Mich.

SYRACUSE D NEW YORK

DIEFENDORF

. . . for all types of gears.

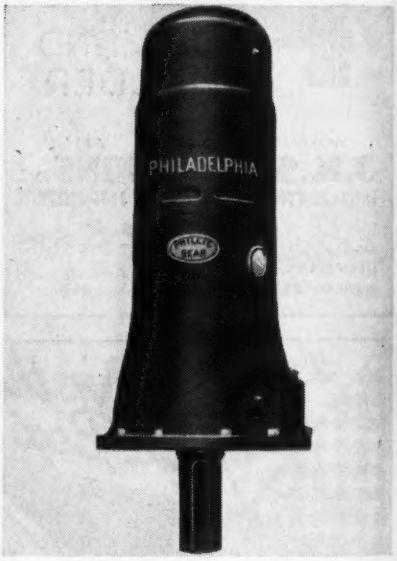
When you want gears, you will save time and money by sending your inquiry to DIEFENDORF . . . . . Cutters of all types of gears . . . . from all metals and other materials. Let us quote on your next requirement.

DIEFENDORF GEAR CORPORATION
Syracuse, New York

with jaws from 2½ to 7 in. wide to open from 3½ to 12 in. Weights will run from 14 to 210 lbs., depending on the size of the vise.

Two New Sizes of MotoReduceRs Announced

Two new sizes—No. 405 and No. 444—have been added to the standard series of the totally-enclosed, fan-cooled MotoReduceRs made by Philadelphia Gear Works, G St. and Erie Ave., Philadelphia, Pa. With several refinements, the new



Open Type Vertical MotoReduceR

units follow the same modern streamline design which has featured this series. This design enables the unit to blend with and appear to be a part of the machine upon which it is installed. The principal advantages are better alignment of the pinions and gears, which reduces noise and wear, conservation of space, and a balanced, rugged assembly which has no overhung parts.

The gear reduction is of the planetary design. All gears and pinions are of heat treated nickel steels and all gears and shafts are mounted on anti-friction bearings. Slow speed shafts are mounted on generously spaced, oversize, tapered roller bearings having a high thrust rating. On the vertical types this con-

RENU TOOL COMPANY

Grinding Specialists

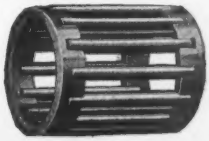
Let us RENU into NEW

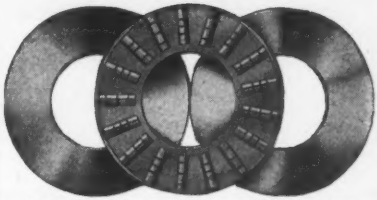
YOUR OLD

Milling Cutters
Slitting Saws
Counter Bores
Drills
Reamers
End Mills
Special Tools

WELDON TYPE
FAST SPIRAL END MILLS
OUR SPECIALTY

RENU TOOL COMPANY
317 E. Milwaukee Ave.
Detroit, Mich.





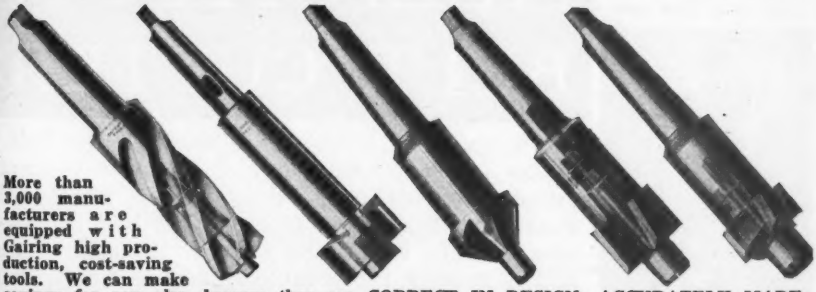
BALL THRUST BEARINGS
ROLLER THRUST BEARINGS
JOURNAL ROLLER BEARINGS

Special Bearings Made to Order.
Send Sketch or Sample for Quotation.

Catalog Upon Request

THE GWILLIAM CO.
358 Furman St., Brooklyn, N. Y.

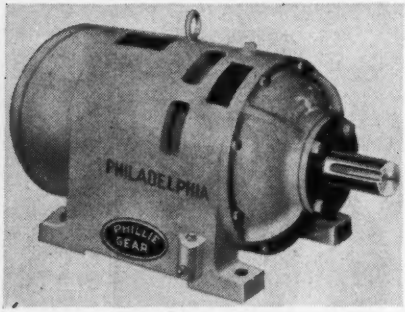
GAIRING COST-SAVING TOOLS



More than 3,000 manufacturers are equipped with Gairing high production, cost-saving tools. We can make savings for you also, because they are CORRECT IN DESIGN, ACCURATELY MADE, UNIFORM AS TO HARDNESS, and LONGER IN LIFE. Our Engineering Department will be pleased to make recommendations to meet your specific problems.

REPRESENTATIVES IN PRINCIPAL CITIES **WRITE FOR CATALOG**

THE GAIRING TOOL CO.
1629-35 WEST LAFAYETTE · DETROIT, MICHIGAN



Fan-Cooled Horizontal MotoReduceR

struction allows vertical shafts, paddles, impellers, and so on, to be hung directly from the drive shafts, thereby eliminating the objectional step bearings. Every part is accessible.

The splash system of lubrication is employed in the horizontal types, the armature extension, carrying the high speed pinion, being equipped with a specially designed grooved oil slinger which prevents oil from reaching the windings. The vertical types are equipped with the force-feed system. A simple, built-in plunger type of pump is driven from the vertical shaft and insures an adequate supply of oil to the top bearings and gears as well as those in the lower casing. The design is such that the entire pump may be removed for inspection, if desired. Oil leakage is impossible.

Both new types are water-proof and dust-proof. The No. 444 unit has a very efficient double ventilation system provided by hollow inner fins through which air is circulated by the fan.

Van Keuren Improved Light Wave Equipment

A new and improved light wave equipment which includes more accurate and better wearing optical flats and a greatly improved monochromatic light has been placed on the market by The Van Keuren Company, 12 Copeland St., Watertown, Mass. The equipment, shown in Fig. 1, is suitable for testing flatness of commercial lapped flat surfaces or for making length or diameter measurements of precision gage blocks, plug gages, or steel balls.

The optical flat set consists of two 2 in. diameter by $\frac{5}{8}$ in. thick single surface semi-quartz working flats of 0.000002 in. accuracy, one 2 in. diam-

REG. U. S. PAT. OFF

ALLIGATOR
TRADE MARK REG. U.S PAT. OFFICE
BELT CUTTER

You simply PUSH the knife through the belt. Makes a clean, square cut of any belt (except metal stitched) up to 8 in. wide. Combined guard and hold-down clamp holds belt immovable. Knife will make several thousand cuts and is readily replaceable. Used as illustrated or horizontally. Weight 4 lbs. and 3 ozs. net. Order through your distributor.

Sole Manufacturers

FLEXIBLE STEEL LACING CO.

4603 Lexington Street, Chicago

In England at 135 Finsbury Pavement, London, E. C. 2

$10.00 in the U. S. A.

UNIVERSAL
STANDARD
DRILL BUSHINGS

MADE TO
A. S. A. SIZES

LOWEST COST
LONGEST LIFE
EASILY REPLACEABLE
THERE'S A SIZE FOR
EVERY REQUIREMENT

UNIVERSAL
ENGINEERING CO.
FRANKENMUTH, MICH.

UTILITY GRINDER

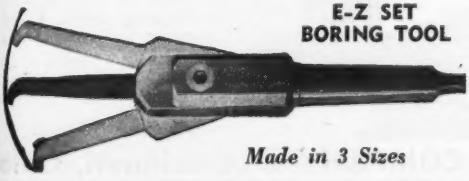
EXTERNAL or INTERNAL GRINDING on a Lathe, Shaper or Planer. Make your old Tool and Cutter Grinder a self contained unit, replace the spindle head with a Utility Grinder, also can be adapted to internal Grinding Machines.

MOTOR—Constant speed, ¼ H. P., heavy duty. Ball Bearing 3500 R. P. M. No metal contact between motor and bracket. Rubber insulation absorbs motor vibration.

GRINDING SPINDLE—Alloy steel, standard precision ball bearings, spindle adjustment automatic regardless of temperature.

Complete $65.00

E-Z SET
BORING TOOL



COMPACT, RIGID, Small body, larger boring capacity. Adjustment actuated by a worm. Straight or taper shank. Adjustable to Jig and Fixture, Production or Maintenance work.

$13.50 to $27.50

Made in 3 Sizes

F. A. MAXWELL CO.
3 Magnolia Drive
BEDFORD, OHIO

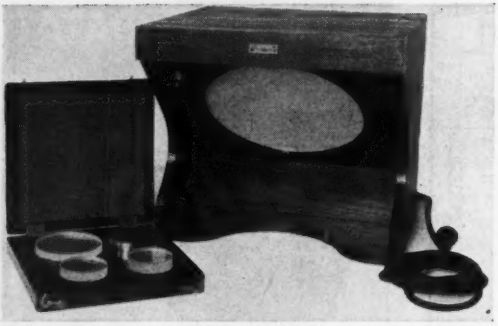


Fig. 1—Van Keuren Improved Light Wave Equipment

eter by ½ in. thick double surface steel working flat of similar accuracy, and one 3 in. diameter by ½ in. thick single surface master flat of 0.000001 in. accuracy. These flats are twice the accuracy previously guaranteed and the semi-quartz material from which the flats are made shows wearing qualities from 3 to 4 times greater than the optical glass of former equipments. The flats have also been made in the thickness indicated to insure freedom from distortion in use.

The new monocromatic light as shown in Fig. 1 is housed in a nicely-finished mission oak cabinet 12 in. wide by 11 in. deep by 11 in. high, with space inside to house a gas-filled tube similar to those used in neon signs with necessary transformer, switch and diffusing glass.

The light tube is 10½ in. overall length with chemically treated electrodes and has a 4 in. diameter coil to provide the necessary light and insure long life. It is filled with a special gas that emits a strongly monochromatic light of 11.6 millionths of an inch per dark interference band. The life of the tube is estimated to be from 1000 to 2000 hours continuous use. A 3000 volt transformer operated from a 110 volt, 60 cycle supply provides proper lighting for the tube. This small amperage is not dangerous and the transformer is enclosed within the cabinet.

The performance of the new light is shown in Fig. 2. Here the clearly defined light wave interference bands which are visible with the new monochromatic light are shown in checking the four

CENTERLESS GRINDING

Accuracy — Prompt Service

COMMERCIAL CENTERLESS GRINDING CO.

6538 Carnegie Ave., Cleveland

STEEL BENCH LEGS

For Factory & Shop

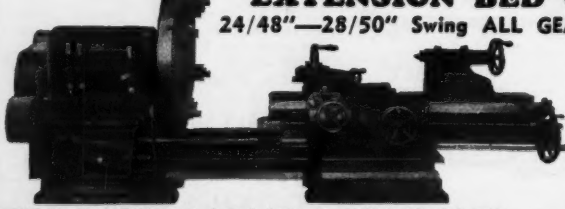
Sturdy ALL-STEEL construction, well braced and welded thruout. Painted Moss Green. Height Overall 29". Width Overall 26". Top and bottom rail punched to take a 12" plank. Also special built bench legs.

Write for prices and literature.

Erie Concrete & Steel Supply Co.
13th & Cranberry Sts. Erie, Pa.

EXTENSION BED GAP LATHE

24/48"—28/50" Swing ALL GEARED OR CONE HEAD



A lathe for small and large swing work. Long distance between centers. Three lathes in one. Saves space. Reduces cost.

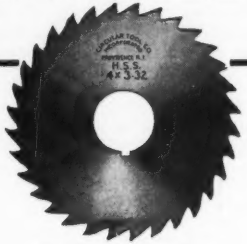
Write for literature.

THE RAHN LARMON COMPANY Cincinnati, Ohio

CUTTING TOOLS

"with a Reputation"

Circle "R" products are made by an organization of experienced saw specialists. Properly used, they are guaranteed to give entire satisfaction.



Send for Catalog

CIRCULAR TOOL Co., INC.

767 ALLENS AVE. PROVIDENCE, R. I.

Branch Offices:
CHICAGO DETROIT INDIANAPOLIS
CLEVELAND and PHILADELPHIA

New "D & W" Chuck

Style S-7 x 17

A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

List price (including Demag. switch) $65.00.

List price (without Demag. switch) $55.00.

●

J. & H. ELECTRIC CO.

202 Richmond St., Providence, R. I.

The Rotor E-1C DRILL

for heavy duty drilling

1200 R.P.M.—3/8"
900 R.P.M.—1/2"

A rugged tool with lots of power.

Smooth running—no vibration—less drill and reamer breakage. Governor controlled.

Weight 9 lbs.

Also made in side handle type.

★

Try one for 10 days at our risk.

★

The Rotor Air Tool Co.

5600 Carnegie Ave., Cleveland, O.

European representative
Gaston E. Marbaix, Ltd., Vincent House, London

optical flats of the equipment against each other. In as much as straight bands identify a flat surface, the excellence of the optical flats is apparent from the unretouched photograph.

Fig. 2—Straight Light Wave Bands Identify a Flat Surface

A very important feature of the new light is that the light emitted is so strongly monochromatic or of one predominating wave length that the bands are clearly visible when the separation of surfaces is as much as 0.005 in. Thus the optical flat need not touch the surface being tested. No sliding motion is necessary to exclude the air film to secure intimate contact, and the formerly undesirable air film now protects the optical flat from actual contact and resulting wear. Also bands are visible on comparatively dull surfaces such as are common on lapped soft steel or on burnished bronze or brass.

Janette Motorized Speed Reducers

The Janette Manufacturing Co., 552 W. Monroe St., Chicago, Ill., has brought out a speed reducer the design of which is a combination of the Janette single reduction worm gear Type SW2, RW3 and RW4 reducers and planetary spur gear units. The result is a type of reducer in which are combined the slow speeds and high countershaft torques of a double reduction unit and high efficiencies comparable to spur gearing. Exceptionally quiet operation is obtained by using worm gearing for the first reduction and planetary gearing for the second reduction, which causes the spur gears to revolve so slowly that they are practically noiseless.

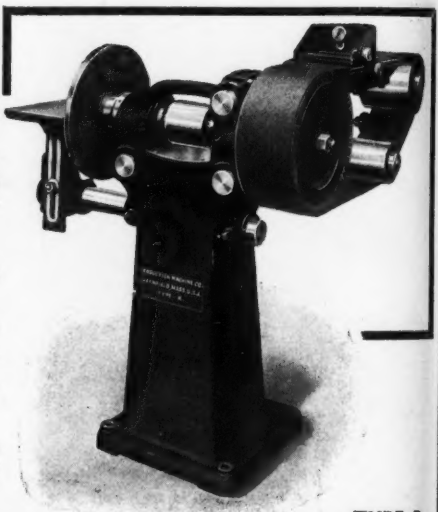
In the first reduction a hardened alloy steel worm is used with a cast bronze gear which has the teeth cut in such manner as to closely conform to the worm. This combination results in added strength, less heating and longer

UTILITY
POLISHER & GRINDER

Do your Disc Grinding, Polishing, Surfacing, Burring, Buffing, etc. all on ONE machine . . . the "PRODUCTION" Type R Grinder.

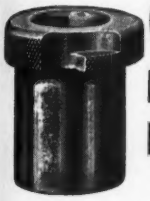
The Type R is equally suited to odd jobs or large lots. It saves space . . . cuts down time on hundreds of jobs . . . improves quality of finish. Sturdy, high quality construction assures long, care-free life.

Write for complete information on the Type R or on any of the entire line of PRODUCTION Polishing Machines.



TYPE R

PRODUCTION MACHINE CO., Greenfield, Mass., U. S. A.



COLONIAL DRILL JIG BUSHINGS

A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

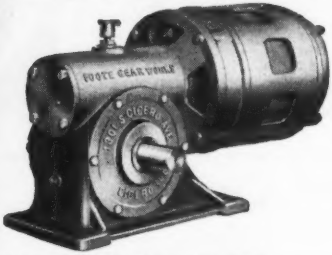
Write for Specification Sheets and Prices

Colonial Bushings, Inc.

145 Jos. Campau St.
DETROIT, MICH.

Explosion Proof

motors may be moved without disturbing underwriters label.



BRAD FOOTE MOTORIZED SPEED REDUCER

Patented feature in all sizes and styles. Oil cannot enter the motor from reducer housing. Write for new 128 page book of useful data FREE. Ask for book No. 6.

FOOTE GEAR WORKS, INC.

1301 E. CICERO AV., CICERO, ILLINOIS

Look!! for the "STANDARD" **SHIELD**

. . . on every tool you buy . . . the

STANDARD SHIELD

is the mark of . . .

"TOOLS YOU CAN TRUST"

TWIST DRILLS
MILLING CUTTERS
DRILL CHUCKS
REAMERS
TAPS, ETC.
SPECIAL TOOLS

THE STANDARD TOOL CO.

CLEVELAND, OHIO

New York Detroit Chicago

life for the gears. The large bronze gear is keyed to the hub of a steel pinion which is in mesh with the three steel planet gears. These planet gears turn on hardened steel studs, located 120 deg. apart on a heavy steel disc, which is welded integral with a rugged countershaft. The disc is driven by the rolling action of the planetary gears between the steel pinion and a large internal gear which is cut directly into the inner surface of the heavy, nickel cast iron housing of the second reduction.

The new reducers can be supplied in the same mounting positions as the

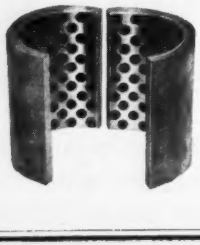
Type MSG Janette Motorized Speed Reducer

SW2, RW3 and RW4 units. Standard foot, flange and foot, or flange mountings are available. The SW2P can be built for a maximum countershaft torque of 150 ft. lbs.; the RW3P for 500 ft. lbs., and the RW4P for 850 ft. lbs. Janette Motorized Speed Reducers are made in single and double worm gear type and single reduction spur gear type. Standard ratios are from 2:1 to 3312:1. Sizes are from 1/50 to 5 h.p.

Write for quotation on standard Woodruff Keyway Cutters
UALITY
Special Cutters made to Blue Prints
QUALITY TOOL WORKS
Waukegan, Illinois

OSGOOD'S
BALANCED - GRIP FILE AND TOOL HANDLES
are used where comfort, durability and economy count.
Write for descriptive Price list. Send dime for sample handle. Steel lined — super service — 10 styles. Use Osgood FILEGRIPS.
J. L. OSGOOD HANDLE COMPANY
43 Pearl St. Buffalo, N. Y.

EVERY SHOP needs these rugged, accurate portable Pyrometers. L88 for checking Surface Temperatures: 800° range with 1 ft. silver tip couple, $17.90. L89 for Non-ferrous Metals: 1600° range with 2 ft. couple and 1 ft. replaceable tip, $19.30. L90 for Furnaces: 2500° range with 3 ft. couple, $19.00. Sent on 30-Day Trial. Circular Free.
RUSSELL ELECTRIC CO.
338 W. Huron St., Chicago
$16
COUPLES
LANCE TYPE
Hold-Heet Pyrometers

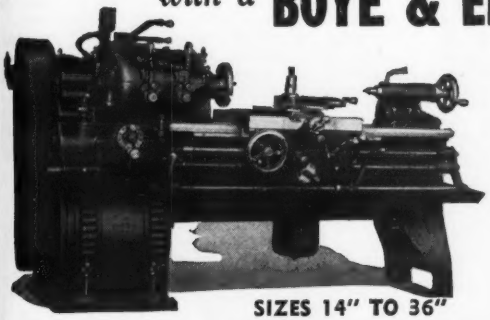


"METALINE"
Reg. Trade Mark

● Metalined Oilless Bronze Bearings require no oil or grease at any time. Furnished in all sizes from 3/8" to 18" inside diameter. Split or one piece, with or without flanges. Send for descriptive folder.

R. W. RHOADES METALINE CO., INC.
5th St. & 51st Ave. Long Island City, N. Y.

YOU'RE ALWAYS ON THE JOB
with a BOYE & EMMES LATHE



SIZES 14" TO 36"

Repairs and costly delays are practically unknown on a BOYE & EMMES Lathe because they're built to render service without interruption. Over 40 years of lathe building experience stand behind every BOYE & EMMES Lathe.

Write for complete facts now!

THE BOYE & EMMES MACHINE TOOL CO.
CINCINNATI OHIO

"The Lathe With The Longer Life"

ENCLOSED
Collet type
FLOATING HOLDER

FOR AUTOMATIC SCREW MACHINES
LATHES
TURRET LATHES
DRILL PRESSES
MULTIMATIC MACHINES

The SCULLY-JONES Enclosed Collet Type Floating Holder has been a big success with machine shops and modern production plants.

This SCULLY-JONES product has "clicked" where many others have failed.

SCULLY-JONES CO.
1901 S. ROCKWELL ST., CHICAGO

Insoluble Smuts
REMOVED
without wiping
by Patented
SATUROL
PROCESS

Here's how . . . simply immerse work in a tank of OAKITE SATUROL. . . . then follow with COLD pressure rinse. So efficient is this remarkable process that in many instances surfaces are ready for subsequent finishes without use of hot cleaning solution. Savings in time, material and effort are so worthwhile you will want all the facts. Write today . . . no obligation.

Branch Offices and Representatives in all principal cities of the U. S.

Manufactured only by
OAKITE PRODUCTS, INC.
36 Thames St., New York, N. Y.

OAKITE
SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

Horat Soft Hammer Mold

The illustration shows a soft hammer mold now being marketed by J. Horat Mfg. Co., 1008 South St., Lafayette, Ind. The mold is of simple but efficient construction, and soft hammers can be poured in a single, simple operation.

The construction of the mold includes but three parts; the bottom of the mold and ladle combined, the top, and the clamp. To use, the hammer handle is

Horat Soft Hammer Mold

placed in position and the mold is closed and clamped. The mixture of lead and babbitt metal is melted in the ladle and when in a molten state, the mold is tilted and the metal runs into the mold. The ladle holds just enough metal for one hammer. The metal cools almost instantly, and upon raising the top of the mold the hammer can be immediately removed.

When the hammer is battered, the babbitt metal is melted from the handle and used over again in the same manner. The mold is made in five sizes, for Nos. 2, 3, 4, 5 and 6 hammers, the numbers indicating the weights in pounds. Handles can be purchased by the dozen.

BREUER'S BALL BEARING TORNADO PORTABLE ELECTRIC BLOWER
BLOWS powerful 275 M.P.H. blast of air into motors and machines. Drives out dust and dirt. Prevents fire, friction, burnouts and shut-downs. VACUUM cleans stock bins, shelves, overhead pipes, walls, rugs, etc. SPRAYS insecticides. 1 H.P. motor. Most powerful blower built —46¼" waterlift.

Free trial—no obligation. Write
BREUER ELECTRIC MFG. CO. 843 Blackhawk St. Chicago, Ill.

For Your Oil-Grooving Jobs . . . the

WICACO

Continuous Oil-Groover

The WICACO easily produces 500 parts per hour using unskilled labor . . . . highly profitable and accurate on all sorts of oil grooving.

Write for Bulletin.

The Wicaco Machine Corp.

Established 1868

WAYNE JUNCTION, PHILA., PA.

GRANT RIVETERS

● Pioneers in the riveting field. Head rivets from smallest to ⅝" diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

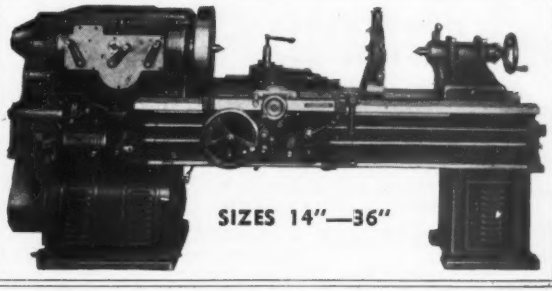
THE GRANT MFG. & MACHINE CO.

96 Silliman Avenue Bridgeport, Conn.

SIDNEY

12-SPEED

SLIDING GEARED-HEAD LATHES



provide simplified, efficient operation and accurate, fast production.

A few outstanding features:

12 speeds through spur tooth gears. Speeds selected by engaging the gears.

Automatic lubrication in the headstock, apron, carriage cross slide, and carriage bearings on the bed ways.

All steel parts of best grade alloy steel forgings, heat treated to maximum tensile strength.

Anti-friction bearings throughout all units.

Headstock shafts mounted on TIMKEN bearings.

Beds of semi-steel (approx. 80% steel) with Brinell hardness of not less than 235.

Write or wire for further information.

THE SIDNEY MACHINE TOOL CO.

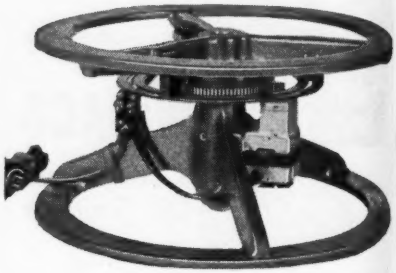
210 HIGHLAND AVE., SIDNEY, OHIO

"LATHES & MILLING MACHINES"

Speedway "Giant" Turntable

The illustration shows the Giant Type 287AB Turntable which has been placed on the market by Speedway Manufacturing Co., 1825 S. 52nd Ave., Cicero, Ill. The turntable has a cast steel frame, is 20 in. in diameter and 10 in. high, and will support a balanced load of 500 lbs. It is powered by the back-geared Speedway 110-volt A.C., D.C. or Universal "flea power" motor which is so designed that it is said to eliminate the need for transformers, rheostats, resistance units, and so on. The load is taken on a ball bearing thrust and the turntable is equipped with collector rings as standard equipment so that the rotated oject may be lighted or operated from the regular 110-volt line.

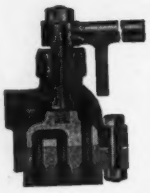
The speed of the turntable is approximately ¾ r.p.m., although other speeds



Speedway "Giant" 500 Lb. Turntable

are available. The height overall is 10 in. and the diameter at both top and base is 20¼ in. Net weight, 75 lbs. The top ring is drilled for an attachment of table top or platform and the base is drilled for screwing to the floor. Furnished with lead cord and plug.

The manufacturer states that the



2, 3 & 4-way VALVES

For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 5000 lbs. Made in Lever, Foot and Solenoid and Motor Operated types.

Bulletins on request

W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Pa.

CENTERLESS GRINDING

STRAIGHT - CYLINDRICAL
DOUBLE DIAMETER
SHOULDER AND PROFILE SURFACES
All Kinds of Materials

SCREW MACHINE PRODUCTS, HEAT-TREATED AND GROUND, IF NECESSARY
Send Blueprints or Samples for Estimates

PORTER MACHINE COMPANY
3120 FORRER AVE. CINCINNATI, OHIO

GEARS

Spur-Helical-Worm-Bevel or Special Gears

Grinding Surface Internal External Lapping

Splining and Broaching — A large stock of standard broaches on hand for buyers of small quantities. 25 years of serving the machine trade guarantees you of our quality of work and prompt service.

We solicit your inquiries.

THE TAYLOR MACHINE COMPANY
1919 E. 61st St., Cleveland, Ohio

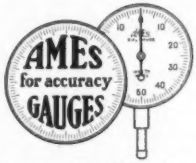
• Make Your Own Soft Hammer with a HORAT MOLD . . . .

Soft metal hammers are indispensable in the machine shop . . . their use eliminates injury to finished parts. You can quickly mold your own Soft Hammers with the HORAT MOLD. Molds obtainable in five sizes. One hammer handle accompanies each mold. Write for prices. Sold on a money back guarantee.

J. HORAT MFG. CO.
LAFAYETTE INDIANA

AMES GAUGES

Simplified for Accuracy



Fewer parts, sturdily constructed and easily replaced, make gauges that measure accurately for long periods of time. In AMES Gauges, simplification is accomplished by assembling wheels, pinions and springs onto one large staff that otherwise would require two or more staffs. This exclusive and patented single staff assembly has only a simple support, held by but two screws.

Many types and sizes of gauges are shown in our catalog.

Be sure that you have a copy.

B. C. AMES COMPANY
WALTHAM, MASS. 444

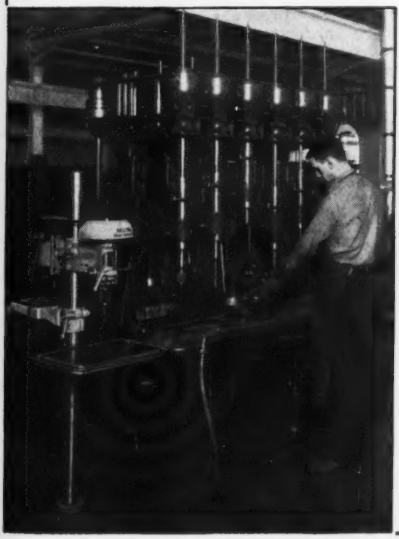
PUTNAM
END-MILLS
for Production

For economy . . . improved finish . . . maximum production . . . higher feeds and speeds . . . use PUTNAM High Speed End Mills. Consistent use of quality materials and experienced workmanship guarantee the outstanding performance of PUTNAM End Mills.

Write for free copy of the New Putnam End Mill Catalog.

Putnam Tool Co.
2981 Charlevoix Ave.
Detroit, Michigan

Call for a "DELTA"



WHEN YOU NEED ADDITIONAL SPINDLES IN A HURRY

What does the alert production superintendent do when he needs seven spindles—with only a six spindle machine available? Or five spindles when there is only a four-spindle machine in the shop? Or an extra spindle for any machine?

The answer is simple—he simply sets a Delta drill press alongside the regular machine and the problem is solved.

Despite their low cost Delta drill presses will "stand up and take it" alongside any drill press in the shop. They solve problems every day for the shop superintendent and tool engineer. Production men everywhere are realizing more and more that this high-grade, portable, economical machine has revolutionized the sensitive drill-press field.

Write for name of nearest Delta dealer—and full details on Delta Drill Presses.

THE DELTA MFG. CO.
624 East Vienna Avenue,
Milwaukee, Wisconsin

DIAMOND TOOLS
FOR ECONOMY

All types for dressing grinding wheels. Shaped Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.
Send for price list and specify your requirements.

E. KARELSEN, INC.
Established 1852
15 West 44th St., New York, N. Y.

CRALEY OFF-SET BORING HEAD

No. 4 Head for Boring holes to 10" diameter.

Write for Prices

These Boring Head Sets are made in six sizes.

C. C. Craley Mfg. Co., Shillington, Pa.

NEW PALMGREN ANGLE VISE

Write for literature.

At Any Angle No. 0 Widths 2½", opens 3". Depth 1 7/16", length 8". Weight 10 lbs.

only **$7.50**

Chicago Tool & Eng. Co., 8400 S. Chicago, Ave. Chicago, Ill.

rated capacity of 500 lbs. is low in order to allow a wide safety factor, the idea being that the user will probably overload the turntable anyhow but the manufacturer wants to prevent too much of an overload if possible.

Nicholson Style H Hydraulic Valves

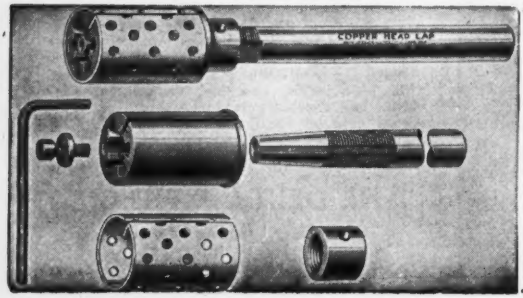
The Style H Hydraulic Valve now being made by W. H. Nicholson & Co., 12 Oregon St., Wilkes-Barre, Pa., is constructed with an exceptionally large diameter stem which is connected to the disc by means of a large area bolt and, in conjunction with the disc, acts on the principle of a differential piston. Pressure is always maintained in the body of the valve, exerting force downward on the disc with its larger area, and upward on the stem with its somewhat smaller area.

Nicholson Style H Hydraulic Valve

With these opposing forces being exerted in the correct ratio, the valve is balanced, permitting the disc to operate easily on its seat and still hold tight. The two spring-balancing nuts are used to exert any required amount of downward or counterbalance on the stem, through the cross bar and ball, in order to overcome any back pressure, water hammer or shock that might have a tendency to lift the disc off of its seat when the valve is opened or shut quickly.

Six drilled holes are also provided in the stem in which air is trapped when the valve is filling; thus forming air cushions which ease the shock of water hammer against the stem. The valve can be installed and operated in any position; upright, horizontal or inverted.

The valve is made in two-, three-, and



LOWER YOUR LAPPING COSTS

with Groetchen Copper Head Expansion Laps. Profitably used in hundreds of leading shops. Available in sizes from ⅛" to 2½", graduated by sixteenths of an inch. Many other designs for special applications.

Write for Bulletin C 40

GROETCHEN TOOL & MFG. CO.
124 N. UNION ST., CHICAGO, ILL.

CYLINDRICAL SUB-PRESSES

Are especially desirable for producing clean cut, accurate parts with compound dies. For after operations, swaging, piercing, trimming, etc., the overhang type is preferred. We have had a long experience in making such dies. Please send us samples or drawings for estimate.

ARCH TYPE

Waltham Machine Works

WALTHAM, MASS.

THE NEW SHELDON 11" LATHE

• 11¼ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

Sheldon Machine Co.

3253 Cottage Grove Ave.

CHICAGO, ILLINOIS

Whatever Your Test for Wearing Qualities

TRY IT ON THIS TOUGH GUY

Ball Bearings
Ni-Steel Iron Wheel
Hyatt Bearing Wheel
One-Piece King Bolt and Plate
Drop-Forged SAE 1045 Steel (Brinnell Rating 230)
Alemite Zerk Lubrication

Some people put great store in tests. They buy only that materials handling equipment which has survived some very rough treatment—enough to assure 12 or 15 years of normal service. We approve their carefulness.

It is the buyers like these who will rave about the Service ForgWeld Caster as the running gear for every heavy duty floor truck, dolly, portable machine or box truck in the plant. They are the easiest prospects for ForgeWeld—because they will actually make tests. They take the only means to prove how many years this super-caster will last. We made it outlive any caster on the market, but that was only two years ago.

But it is certain this caster has EXTRA Years compared with what you are using. And that suggests you get acquainted with it. Write for the Circular giving full details. Service Caster & Truck Co., 596 N. Albion St., Albion, Mich.

SERVICE

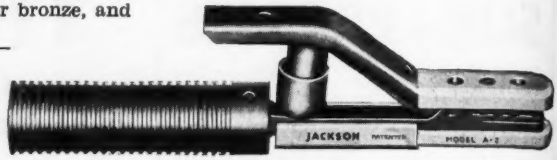
ForgeWeld

four-way types, for oil or water service up to 5,000 lb. pressure. The body can be made either of electric furnace cast steel or Superstrength bronze, with a stem of Monel metal, base of hardened stainless steel, disc of Everbrite metal (32% nickel composition) or bronze, and lever of steel.

Jackson Insulated Electrode Holder

At least 90% of the flashes that welders get are caused by contacting the ordinary bare type electrode holder with grounded parts. To eliminate such flashes, to provide a maximum degree of safety for the operator and protection for the work and to provide longer and more economical holder service, the Jackson Electrode Holder Co., 6553 Woodward Ave., Detroit, Mich., is introducing a new model embodying radical improvements in design.

The new holder, like previous Jackson holders, is completely insulated, air circulation being provided between insulation and metal to achieve coolness. In spite of the insulation, total weight of the Jackson holder is about that of bare type holders of comparable capacity. A special copper alloy has been adopted for the structural parts of the holder, combining strength with adequate conductivity.



Jackson Insulated Electrode Holder

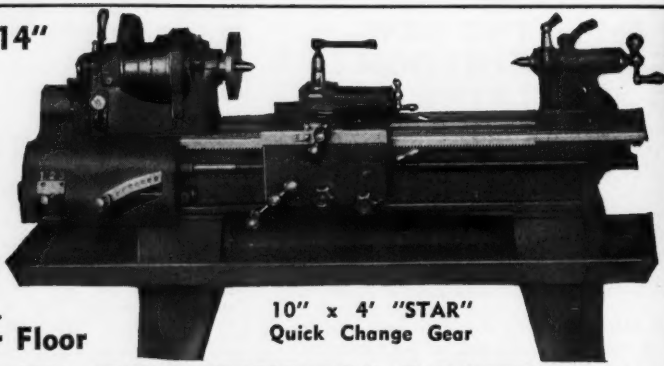
The jaws of any holder are the parts first to burn out, consequently the Jackson holder is provided with replaceable jaws of Mallory 3 Metal, a copper alloy that is already widely used for spot welding tips, flash welding dies and seam welding wheels. It combines the tensile and elastic properties of structural steel with the high electrical conductivity and corrosion resistance of pure copper. This jaw construction has unusually long life and, when jaws ultimately do become worn, replacement is simple, easy and economical, adding indefinitely to the life of the holder.

10"-12"-14" Swing

4' to 10' Beds

Plain or Quick Change

Bench or Floor



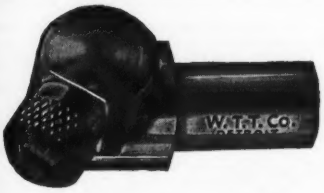
10" x 4' "STAR" Quick Change Gear

STAR PRECISION LATHES

For more than 60 years "STAR" has stood for quality and accuracy in lathes. In manufacturing, tool room and laboratory service the world over, STAR LATHES have established performance records over a long period of years which are little short of phenomenal. By all means, if you want more per lathe dollar, investigate STAR. Ask for catalog No. 32M and proof of STAR superiority. A few territories open for dealers, preferably with display facilities.

STAR LATHE DIVISION

SENECA FALLS MACHINE CO. Seneca Falls, N. Y.



Real Economy

Write for Circular

Every user of diamond dressing tools should investigate the TRUCO Wheel Dresser. In addition to its economy, it is highly efficient, unusually flexible, strongly built and long in life. Diamond always remains sharp.

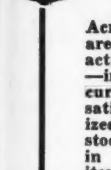
$5.00 and up

WHEEL TRUEING TOOL CO., INC.
13931 OAKLAND AVE. DETROIT, MICH.

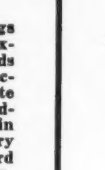
Standardized JIG BUSHINGS
Acme Standard over 6700 items
A.S.A. Standard over 4200 items

Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

Send for bulletin, containing complete details, sizes available and low prices.



ACME INDUSTRIAL COMPANY
421 N. Carpenter St.
Chicago, Ill.



No. 13 of the Series

WHAT ARE THE VARIOUS COATED ABRASIVES?

What Are Their Uses?

SPECIAL-PURPOSE COATINGS

By E. B. Gallaher
Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

DURING the past year many of the manufacturers have introduced special-purpose coatings to meet a demand for super-sharp goods. These coatings are so made that they cut very rapidly at first, which is a desirable feature for certain kinds of wood-working operations, in the leather trade and the like.

● Such coatings have not proven of value in metal-working operations and in other similar situations where hard work and long life are essential for maximum production.

● Much publicity has been given to these new coatings, and the most extravagant claims have been made as to their efficiency—some manufacturers even claiming from 40 to 50 per cent! Needless to say that such statements are without foundation in fact.

● These new coatings at their best, and where employed on special work to which they are suited, have demonstrated a higher cutting efficiency of possibly 5 to 6 per cent, but no more.

● To produce these sharper goods, manufacturers have resorted to various innovations in applying the grain to the glued surface—some use new mechanical devices, some static electricity.

● The results are all the same, however, and equal efficiency may be obtained from the special coatings of any manufacturer, no matter what new brand name may be employed to designate this new type of material.

● Some of the recent trade names employed for identifying these extra sharp coatings are as follows:

Comet	Elek-Tro-Cut
Electrocoat	Lightning

● These new style coatings are very generally limited to Aluminum Oxide—their principal advantage will be found in special wood-working operations.

● They do not replace the standard coatings, but are to be considered only as additional numbers to the standard lines.

Gallaher

CLOVER MFG. CO., NORWALK, CONN.

Also makers of the famous
CLOVER GRINDING AND LAPPING COMPOUNDS

DRIVER "900" Drill Press

D925

$35.00

Bench model with standard pulley and motor belt, less motor. Slow speed pulley with 2 SKF ball bearings available extra

Floor model available with 60" column.

Modern design, low operating cost, dependable service—these and many other features justify your making a point-by-point comparison with any drill press of like capacity.

Features: 6 splined spindle. 4 SKF ball bearings. Jacobs 0 to ½" Key Chuck. Table size 10"x9" adjustable to tilt any angle. Diameter steel column 2¾". Spindle travel 4". Steel quill 1 13/16" diameter with teeth to match feed pinion milled into it. Speeds standard pulley 600-1250-2440-5000 R.P.M. Speeds slow speed pulley 480-940-1300-2900 R.P.M. Height over all 39½". Shipping Wgt. 125 lbs.

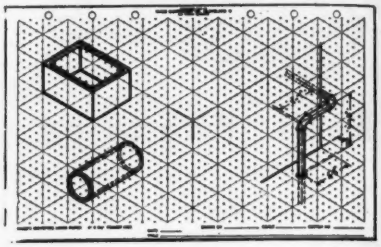
Write for Bulletin MS6

Walker-Turner Co. Inc.

Plainfield, N. J.

Isometric Lined Sketch Paper

The paper illustrated is a new develvelopment of the Wade Instrument Co., 1663 East 118 St., Cleveland, Ohio. By just following the green guide lines,



Isometric Lined Sketch Paper

lifelike sketches in three dimensions may be quickly and easily drawn. Any scale may be used as the lines are spaced 1 in., ½ in. and ¼ in. Width is measured on one Isometric horizontal; length on the other and height on the verticals.

The paper is put up in pads, making it adaptable to freehand sketching in both the plant and field. Printed on buff bond drawing paper to prevent undue glare from sun or strong lights, cleaner, and makes a sharper contrast with pencil lines.

It is sold in pads of 100 sheets pocket size, 4x6½ in.; 50 sheets 8½x11 in. and 24 sheets 11x17 in. Holes are marked on each sheet so they may be punched to fit loose leaf standard binders.

Disston "Nu-Mol" Hack Saw Blades

Nu-Mol Hack Saw Blades, product of Henry Disston & Sons, Inc., 421 Tacony St., Philadelphia, Pa., are offered as the most advanced development in general-

GEARS

Good Gears Only

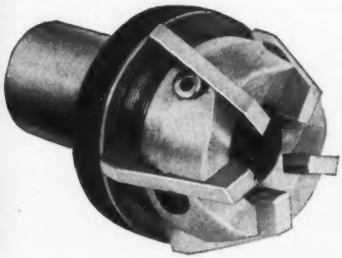
All Kinds

Any Quantity

At the Right Price

THE CINCINNATI GEAR CO.

1825 READING ROAD, CINCINNATI, O.



GENESEE ADJUSTABLE HOLLOW MILLS

Are Cutting Costs Everywhere

SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now. Write for catalog.

GENESEE MFG. CO., Inc.

141 No. Water St., Rochester, N. Y.

Oiled Air is better than a poor memory for Air Tools!

A Norgren Sight Feed Automatic Air Line Lubricator feeds oil to the tool **with the air that drives it.** Constant, automatic lubrication. Adjustable from zero to complete saturation of air stream. Shipped on trial to any rated concern. Write for specifications and prices.

C. A. NORGREN CO., INC.

2018 Market St., Denver, Colorado

SENECA FALLS AUTOMATIC WORK DRIVER

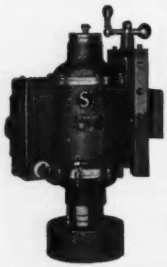
No. D31
$42.00
Discount to Dealers

Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces — straight or taper. Eliminates dogging time. Reduces tool breakage.

NEW SMALL SIZES now ready—for work $\frac{3}{8}$" to 1" dia. Suitable for bench lathes.

Write for details and size range.

SENECA FALLS MACHINE CO.
322 Falls Street
Seneca Falls, N. Y.



STANDARD
VERTICAL ANGLE PLATE GRINDER
For Planer, Boring Mill, etc.
2, 3, 5, 7½ and 10 H.P. sizes. 1750 or 3400 R.P.M.
Tool Post and Angle Plate Grinders for Lathes, etc.
Write for catalog.
THE STANDARD ELECTRICAL TOOL CO.
8th & Evans Sts.
Cincinnati, Ohio

STAMPINGS
IN LARGE AND SMALL QUANTITY RUNS
Also Short Run Stampings eliminate expensive tools.
MODEL WORK
Send sketch or samples for quotation.

GERDING BROTHERS
THIRD & VINE STS. CINCINNATI, O.

Rotary Files
HIGH SPEED STEEL HAND CUT--ALL SHAPES
SEND FOR ILLUSTRATED 10th Anniversary Catalog—showing multitudes of styles, shapes and cuts.
THE ROTARY FILE COMPANY
STRATFORD • CONN.

purpose hack saw blades. Nu-Mol has wear resistance, predetermined by Disston research and experimentation, said to establish new value and new economy in hack saws for the average run of work.

It is claimed that Nu-Mol blades are proving to be tough, strong, and to

Package of Disston "Nu-Mol" Hack Saw Blades

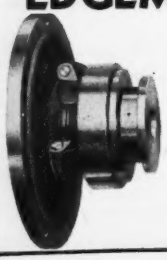
afford the maximum of productiveness and economy, especially in hand use where blades must stand extreme abuse, and in power use where small stock, stacked and bundled, subjects hack saw blades to undue strains.

Disston Nu-Mol Hack Saw Blades are made standard lengths, widths, thicknesses and teeth. Packed, hand blades ½ gross in box; machine blades 1 dozen in box. Nu-Mol, on orange band, together with the name Disston, identifies this new blade and assures quality and workmanship.

NEW PUBLICATIONS

NEW WAYS TO INCREASE SALES AND PROFITS WITH SILCROME STAINLESS STEEL is the title of a 28-page, 8½x11 in. book which presents, in an attractive and interesting manner, the wide range of uses of stainless steel. Judging from the illustrations, stainless

"EDGEMONT" SERVICE TESTED FRICTION CLUTCHES



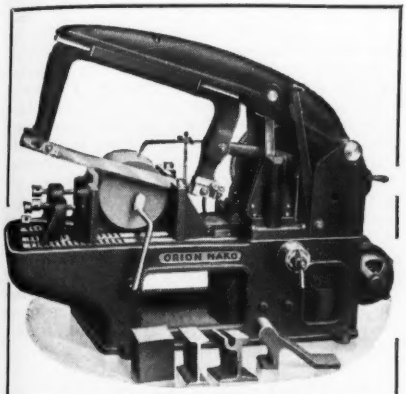
What are you looking for in a clutch?

Easy Operation?
Instant Release At Any Speed?
Quick One Hand Adjustment?
A Simple, Compact Design?
Low Initial Cost and Upkeep?
Dependable Every Day Service?

Then give the EDGEMONT "TYPE SF" DISC CLUTCH a trial. It has all these and more. This clutch is furnished in a complete line of pulleys, extended sleeves, and cut-off couplings. The "Type SF" Mechanism only is furnished to those who prefer to make their own applications.

Send for complete information.

The Edgemont Machine Co.
2100 HOME AVE. DAYTON, OHIO



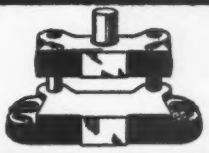
HYDRAULICALLY CONTROLLED

POWER HACKSAW

Flexible Feed - Pressure
Vibrationless Operation
Long Life of Saw-Blades

Marburg Brothers, Inc.
90 West St. New York, N. Y.

BAUMBACH



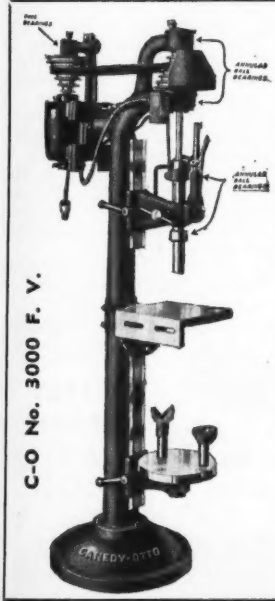
STANDARDIZED DIE SETS

SEMI-STEEL — DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.

Send for Our New 208 Page Catalog.

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave., Chicago, Ill.



CANEDY-OTTO

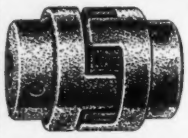
SLIDING HEAD SENSITIVE DRILL WITH FULL BALL-BEARING SPINDLE

This CANEDY-OTTO Drill is built to give the greatest degree of speed and accuracy in drilling holes up to 5/8" in diam. Annular ball bearings in the spindle, two ball bearings on the spindle cone pulley, and self-aligning ball bearing on the motor bracket assure precision drilling and unusually long life. Motor bracket is of the hinge type for quick change of the belt from one speed to another. High grade motor drives spindle thru heavy endless V-Belt . . . proper belt tension easily obtained . . . wide range of spindle speeds provided by six-step sheave type pulleys. You will profit by fully investigating this sensitive, easily operated C-O floor drill which is furnished in any voltage, cycles or phase . . . completely equipped. CANEDY-OTTO Drills are always "READY FOR THE JOB".

Write today for Bulletin C-O No. 3000 F. V.

CANEDY-OTTO MANUFACTURING CO.
CHICAGO HEIGHTS ILLINOIS

"Alnor"
Pyrometers
For the Hardening Furnace
Price complete without protection tube. $13 to $36.00 and up
Write for Information
ILLINOIS TESTING LABORATORIES, Inc.
146 W. Austin Ave. CHICAGO, ILL.

L-R FLEXIBLE COUPLING
everlasting

Type "I-A" from ¼" to 3" bores. (Other types to 14".) Non-lubricated — low cost — trouble-free — noiseless.
PATENTED
Write for test sample.
LOVEJOY TOOL WORKS
8007 WEST LAKE STREET CHICAGO, ILLINOIS

STEELGRIP Belt Lacing

A stronger lacing (treated steel) in sizes and widths for ALL power transmission and ALL conveyor belts. Compresses belt ends, prevents fraying and adds to life of belt. 8 sizes. Comes boxed in convenient lengths or in special extra lengths. Furnished in Monel Metal for use under corrosive conditions. Write for catalog and prices.
Armstrong Bray & Co.
303 N. Sheldon St.
CHICAGO, U. S. A.

steel is adaptable for all kinds of containers, utensils, fixtures, processing in which products are conveyed through heating or chemical processes, hospital equipment, decorative grills and panels, vats and tanks, parts which must be impervious to the effects of extreme heat and corrosion, and so on. The extremely high resistance to heat and corrosion recommends Silcrome Stainless Steel for a vast variety of uses where maintenance costs have been high in the past, and where appearance is an important factor.

According to the book, Silcrome Stainless Steel is available in all forms including bars, wire, strip, sheets and plates. A copy of the book is available upon request to Ludlum Steel Co., Watervliet, New York.

"How To Cut Screw Threads" and "How To Grind Lathe Tool Cutter Bits". Two new booklets: "How To Cut Screw Threads" and "How To Grind Lathe Tool Cutter Bits", are now being published by The South Bend Lathe Works, South Bend, Indiana. The material is presented in such a way that it is easily understood. The booklets contain a number of illustrations which accompany the descriptions, and give the reader a clear-cut idea of each operation.

"How To Cut Screw Threads in the Lathe" covers the whole subject very thoroughly. Besides a detailed step by step description of cutting threads in a lathe, the booklet contains sets of tables of standard screw thread pitches and recommended tap drill sizes, definitions of various terms relating to screw threads, and several pages devoted to arrangements of gearing. Space is also given to metric screw threads, the use of taps and dies, formulas for standard screw thread forms, several interesting shop hints and kinks, etc.

The second Book, "How To Grind Lathe Tool Cutter Bits", describes the

HINGES
VARIOUS WIDTHS and GAUGES

BUTTS AND CONTINUOUS LENGTHS
WRITE FOR PRICES
For GUARDS CABINETS CASES BOXES
S & S MACHINE WORKS
4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS

COLUMBIA LOCK-NUTS

Makers of
LOCK-NUTS
NUT-LOCKS
for every use
since 1900
Ask for Samples

COLUMBIA NUT & BOLT CO., Inc.
BRIDGEPORT, CONN.

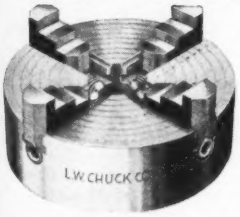
M-D Facing Heads
With Automatic Feed

Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30".

Write for Circular

MUMMERT-DIXON CO.
120 Philadelphia St. Hanover, Pa.

ANNOUNCING THE NEW L-W LATHE CHUCK



Semi Steel Body 12" Four Jaw Independent

Body is heavily ribbed and will withstand unusual strain, Ground finish.
Jaws are hardened steel. Ground and accurately fitted. Four solid reversible jaws.
Screws are of tough nickel steel and hardened.
WEIGHT 75 LBS.

Every L-W Chuck is guaranteed to give satisfaction and service. This heavy body Chuck is designed for general shop use and is accurately aligned and fitted. Only the finest materials and workmanship are used in the manufacture of this Chuck.

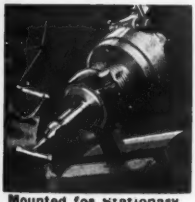
$33.50

This Low Price Makes It A Super Value

L-W CHUCK CO., No. 1-7 N. St. Clair St., Toledo, O.

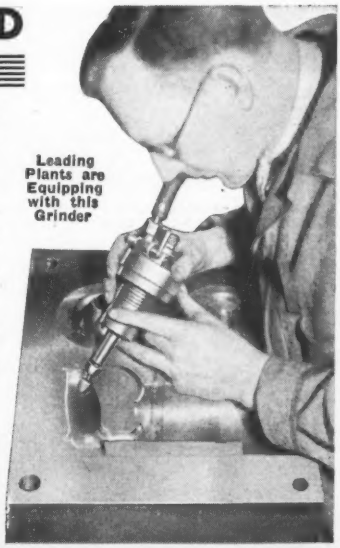
NEW SPEED
NEW POWER

For Die Grinding—Milling—Engraving—Routing in Wood or Metal—Here is a New kind of Speed and a New kind of Power.



Mounted for Stationary Use

50,000 R.P.M. and ¼ H.P. at the smooth, cool, dependable operation of much slower speeds and lower power. Weighs less than 2 lbs. Finely balanced for easy handling. Ball bearing throughout. Automatic oil lubrication. It can not heat up or burn out by stalling in a cut. Effortless in performance and free from vibration or heat, this Onsrud Grinder will give steady day in and day out production without repair. Write for Circular.



Leading Plants are Equipping with this Grinder

50,000 R.P.M. TURBINE GRINDER
WRITE FOR CIRCULAR

ONSRUD MACHINE WORKS Inc. 3900 Palmer St. CHICAGO Ill.

Columbia
TOOL STEEL

Better stainless steels for tools, dies, pump parts, etc., that must withstand corrosion.

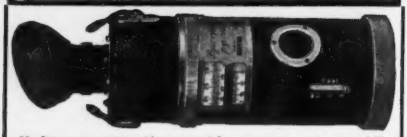
- STAINEX No. 1
- STAINEX No. 2
- STAINEX No. 3

Ask about them.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
MAIN OFFICE AND WORKS
600 E. 14TH STREET, CHICAGO HEIGHTS, ILLINOIS

PYRO THE SIMPLIFIED OPTICAL PYROMETER



Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
101-105 Lafayette St., New York

correct methods of grinding all the popular types of lathe tool cutter bits, and illustrates the particular angles to which each cutter bit should be ground. The illustrations and the accompanying description make an excellent guide for anyone wishing to quickly master this art. The applications for which each of these tools is used is also included, and shows the manner of applying the tool to the work to obtain the maximum efficiency from the tool.

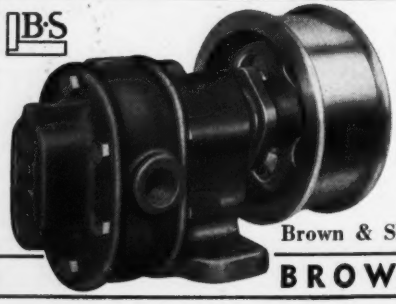
A nominal charge of ten cents per copy is made to cover the cost of handling and postage.

ALKALI CLEANING COMPOUNDS. A solution to the cleaning problems inherent with all types and kinds of metal manufacturing is contained in a 4-page folder now being issued by Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich. The bulletin features "Triad" alkali cleaning compounds and discusses the application of these compounds in the wide range of metal cleaning problems. Examples are quoted of the savings that have been made in various specific instances. The bulletin also points out production economies that can be effected through the use of Detroit-Rex specialized cleaning service. Copy free upon request.

LANDIS COLLAPSIBLE TAPS. This folder, issued by Landis Machine Company, Waynesboro, Pa., explains the design and advantages of the Landis Style LT Collapsible Tap and the Landis Style LM Receding Chaser Collapsible Tap. The bulletin is illustrated with pictures showing the taps in operation. Copy free upon request.

A S A STANDARDS FOR HEXAGONAL TYPE SOCKET SET AND CAP SCREWS. Holo-Krome Screw Corp., Bristol, Conn., has issued a book containing the complete set of standards for hexagonal type

B·S



Specify 1S-2S-3S
for Quietness-Long Life

. . . and besides, these modern rotary geared pumps can be run at High Speeds. Helical gears—renewable bearings—well balanced design. Write—

Brown & Sharpe Mfg. Co. Providence, R. I.

BROWN & SHARPE PUMPS

$1000 TOOL PROTECTION

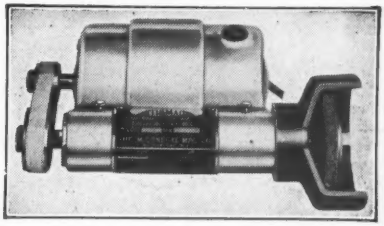
Costly tools and parts safely handled. All tools kept convenient, saving valuable time. Top tray, 2 roomy shelves, drawer with hasp to permit locking, all mounted on 2½" easy rolling casters. Heavy gauge steel 34½" high 24" D. and 18" W. Shipped knocked down. Order direct. Specify red or green baked enamel.

$10.65 NET

LYON TOOL TOTER

LYON METAL PRODUCTS, INCORPORATED
1306 River Street
Aurora, Ill.

THEMAC
PRECISION GRINDER



1/3 H. P. Universal Motor
Adaptable to any GRINDING JOB
Quickly Adjustable to any Lathe Center
Grinder Attaches Directly to Compound-T-Slot
Attractively Priced.
Write for Illustrated Bulletin and Prices.

The McGonegal Mfg. Company
Rutherford New Jersey

SKINNER CHUCKS
TRADE MARK

LONG LIFE--- STRONG GRIP

SKINNER CHUCKS, fine precision tools since 1887, are playing important roles in the increased tempo of industry.

Their predominating use as original equipment on machine tools of the highest grade is evidence of the high reputation of Skinner Chucks with discriminating users.

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN., U. S. A.

socket, set and cap screws as approved by the American Standards Association and sponsored by the Society of Automotive Engineers and the American Society of Mechanical Engineers. The book is 8½x11 in. in size, contains 32 pages, and includes all dimensions of heads, bodies, screw and thread lengths, screw points, sockets and wrenches for same. The book is free to designers, engineers and draftsmen who will address the Holo-Krome Screw Corp. and ask for booklet HK-166.

JACOBS CHUCKS. The series of bulletins describing the various types and sizes of chucks manufactured by The Jacobs Manufacturing Company, Hartford, Conn., which have been issued from time to time are now available bound together in compact form to comprise a complete catalog of Jacobs products. The folder contains eight bulletins, presenting the Jacobs plain bearing chucks, ball bearing chucks, keyless chucks, positive drive chucks for tap holding, single purpose chucks and chucks for lathes. One folder is devoted to specifications and dimensions for all models of Jacobs chucks together with instructions for fitting Jacobs to various machine spindles and another gives repair instructions, a list of parts which are interchangeable, and Jacobs chuck specifications for portable drills.

A copy of this folder is available upon request.

CLEVELAND TRAMRAIL OVERHEAD MATERIALS HANDLING EQUIPMENT. The Cleveland Tramrail Division of the Cleveland Crane & Engineering Company, Wickliffe, Ohio, has issued a 400-page catalog illustrating and describing the complete line of overhead materials handling equipment manufactured by this firm. The line includes the various types of tramrails for use in all different kinds of industries under a wide range of conditions, electric and hand operated cranes and hoists, with and without cabs, slings, grabs, buckets, and other types and kinds of carriers, and all the accessories required for the installation and operation of any and all types of overhead equipment for the handling of containers, racks, foundry ladles, and special material handling devices. The book is profusely illustrated and bound with an embossed leatheroid cover. A copy of this book is available to plant engineers and executives and conveyor engineers who will address their requests on their firm letterheads.

MALL FLEXIBLE SHAFT MACHINES

"REAL PORTABLE GRINDERS"

for

Grinding
Polishing
Sanding
Rust Removing

and a multitude of other applications.

A size and type for EVERY metal working requirement.

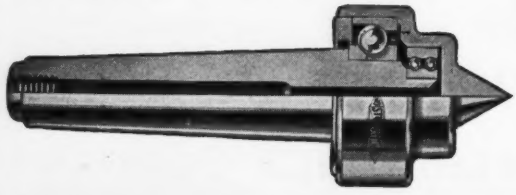
A MALL in your shop will cut costs and step up production!

Write for literature . . . and let us advise you regarding the proper MALL unit for YOUR work.

MALL TOOL COMPANY

7339 South Chicago Avenue
Chicago, Illinois

STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.

Lowest possible overhang prevents vibration and chatter.

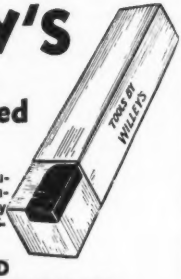
Write for Catalog and Free Trial Offer

STURDIMATIC TOOL COMPANY 5222 THIRD ST., DETROIT, MICHIGAN

SAVE ON TOOLS!

WILLEY'S

Tungsten Carbide Tipped Tools



. . . are uniformly accurate and dependable. Complete stock always ready for immediate shipment.

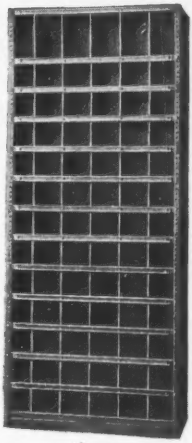
SEND FOR CATALOG
containing full information.

ALSO
write for circular on improved type wheel dressing tool that will reduce your costs.

Willey's Carbide Tool Co.
1352 W. Vernor Highway Detroit, Mich.
Representatives in all principal cities.

SHELVING PAYS!

Protect And Preserve Your Expensive Dies, Tools, Patterns.

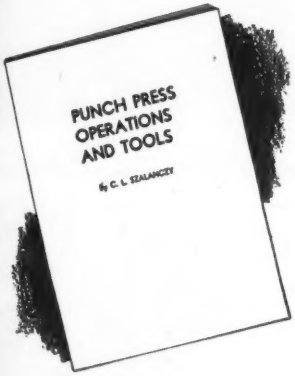


UNIT No. 28
(at right)
Size: 36" wide, 12" deep, 7' 3" high. Number of bins 6—6" w., 12" h., 12" d.; 72—6" w., 6" h., 12" d. Green enamel Finish.

$22.50
Set-up, F. O. B. Phila., Pa.

Parent Metal Products, Inc.
1703-15 RITTENHOUSE ST., PHILA., PA.

NEW BOOK ON PUNCH PRESS OPERATIONS and TOOLS



A new source of practical and highly valuable information for die designers and stamping plant executives.

Written by C. L. Szalanczy, this material first appeared as a series of articles in MODERN MACHINE SHOP magazine and received such widespread acclaim and attention that it is now presented in book form.

PRICE $1.00

Modern Machine Shop
704 RACE ST., CINCINNATI, OHIO

SAFETY IN THE STAMPING PLANT. Stamping Presses; Their Safety, Uses and Abuses. Dedicated to the cause of safety in the stamping shop, this book was prepared by Walter Wuest and J. C. Junkin for the use of insurance inspectors, safety engineers, shop superintendents, foremen, and other stamping plant executives and the for State Safety Engineers and Safety Commission as a guide to practical and efficient means of safeguarding stamping press operations.

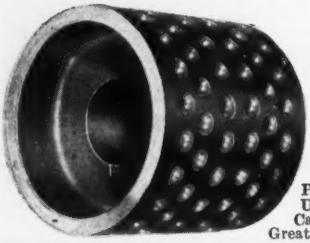
In the course of gathering the information from which the booklet was compiled, the authors visited a great number of stamping plants and observed the variety of devices used to protect the press operators. Many presses were found completely unguarded, and many had guards which had been allowed to get out of repair, rendering them completely useless.

Some presses were guarded with devices so inefficient as to be practically useless, the employers being apparently more concerned with the appearance than with the effectiveness of the device. Other guards were as dangerous as the presses, due to heavy bars or sections which injure the operator's hands or wrists if the hands are struck by the device in use.

Defects in the brake or clutch are often the cause of serious injuries, as defects in the treadle. All of these subjects are thoroughly discussed in the booklet, a copy of which can be had by addressing the Junkin Safety Appliance Co., 932 West Hill St., Louisville, Ky.

HASKINS SANDING DRUMS AND ABRASIVE SLEEVES. Four pages of description of the sanding drums and abrasive sleeves made by R. G. Haskins Company, 4667 W. Fulton St., Chicago, Ill., are contained in a folder which is now being issued by this firm. Detailed information regarding accessories for use

STOP BELT SLIPPING!



Pat'd U. S. Canada Great Britain

VACUUM CUP METAL PULLEYS

Guaranteed to: Eliminate belt slippage and power loss . . . increase life of belts and equipment . . . wear indefinitely . . . keep belts from flying off . . . give many other money saving advantages.

Order now on 30 DAY FREE TRIAL OFFER. Used in many of the largest plants.

Vacuum Cup Metal Pulley Co., Inc
1010 Ford Bldg. Detroit, Mich.

SpeedWay

PROVEN PERFORMANCE ENDS TOOL GAMBLE

Proven types. Established principles of design: crasn-proof steel bodies (lighter), cooled motors, over-powered (will not stall), 12 features that mean more holes and longer, trouble-proof service. A full line to pick from.

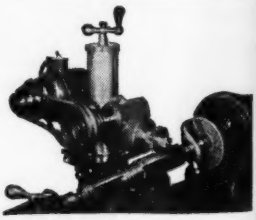
WRITE FOR CATALOG

Speedway Mfg. Company
1825 S. 52nd Ave. Cicero, Ill.

MASTER Lathe Converter

● A sturdy, dependable converter that fits into your lathe tool post T-slot of compound rest and gives you a universal range machine with which you can do an unlimited number of precision milling, grinding, broaching and drilling operations. Takes the place of a large amount of expensive, individual machinery, with only nominal investment. Satisfied customers all over the United States.

MASTER MACHINE & TOOL CO.
18th & Grand Ave. Kansas City, Mo.



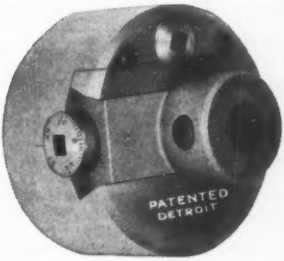
Write today for illustrated pamphlet.

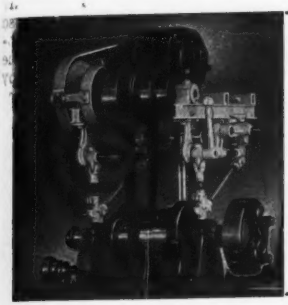
THE ONLY BORING HEAD MADE WITH 4" RANGE

COST LESS: One head covers range up to 15".
LAST LONGER: Rugged construction insures long life under trying conditions.
WIDER RANGE: Has movement in thousandths of from 0 to 4".
INCREASES PRODUCTION: By saving time—less shutting down of machines to change tools and take new readings.

For further information and prices, write:

THE BATTENFELD CO.
5921 SENECA AVE., DETROIT, MICH.





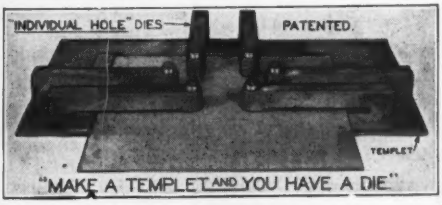
Reduce Power Costs Up to 50%

Install Remco Motor Drives. Smaller h.p. motors used. Drives changeable from one tool to another—not built special. Universal motor mounting—use any motor. V-belt or chain drive. Rigid mounting! No over-hang! Easily installed. Complete line—from hack saws to 42" lathes. Learn how your present machine tools may be Remco equipped at surprisingly low cost. Write! Manley Products Corporation. State & Hay Sts. York, Penn.

REMCO MOTOR DRIVE

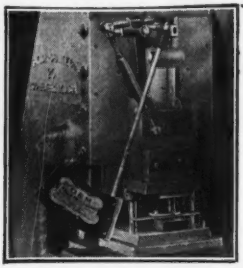
WALES ADJUSTABLE HOLE PUNCHING DIES

NEVER BECOME OBSOLETE. When you change models you reset them to make the new parts. Small runs are made on BENCH set-up, holes in straight lines on PRESS BRAKES, and holes scattered over parts on PUNCH PRESSES. These "INDIVIDUAL HOLE" dies are self contained with the punch and die in the same holder, thus eliminating die setting. Will punch ⅞" holes in 14 gauge steel or under.



Write for detailed booklet.

The Strippit Corporation
1559 Niagara St. Buffalo, N. Y.



SAFETY IS GOOD BUSINESS

Lessen the danger to the fingers of your operators by installing D. & M. Automatic Punch Press Guards. They insure added safety at low cost. You be the judge of their merit.

INSTALL ONE FOR 30 DAYS TRIAL.

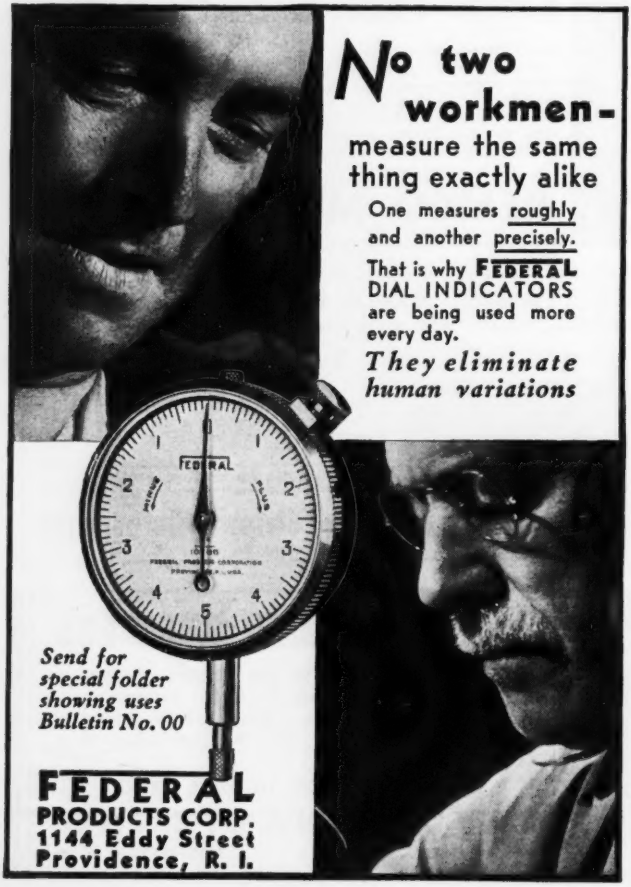
TAYLOR-SHANTZ, INC.
480 ST. PAUL STREET ROCHESTER, N. Y.

with flexible shaft equipment is included. Copy free upon request.

ZEH & HAHNEMANN PATENT PERCUSSION POWER PRESSES. In this 8-page catalog, issued by Zeh & Hahnemann Co., 184 Vanderpool St., Newark, N. J., the line of percussion power presses made by this firm is described and illustrated. Z & H Percussion Power Presses are especially adapted for hot pressing brass and other non-ferrous metals, also for cold pressing of steel parts such as cutlery and surgical instruments and for the press forging of steel parts of the heavier class.

The presses are immune to overload and produce a cumulative blow which, it is said, cannot be equalled by any other type of press. The book includes specifications and illustrations of the straight side pillar press, reducing press, pillar toggle embossing press, selective multiple die punching press with nibbling attachment, double action drawback power press. Copy free upon request.

McCROSKY BLOCK TYPE ADJUSTABLE BORING BAR BULLETIN NO. 15-B. This bulletin comprises 16 pages of photographs, drawings, descriptions, specifications and prices of the adjustable boring blocks and boring bars made by McCrosky Tool Corporation, Meadville, Pa. McCrosky adjustable boring blocks are locked in the boring bars by a centralizing device that assures location of the block in the bar. However, the cutter block can be removed from the bar without removing or disturbing the centering key in the bar; thus a series of different cutter blocks can be used in quick succession with only a few seconds required to change the blocks and with no danger of damaging or losing the centering key. The cutting thrust is not taken by the centering key, but by a separate and hardened thrust block behind the cutter block. Blades are positively locked in McCrosky blocks by an adaptation of the tested pin and screw lock used in Super Reamers. The bulletin tells and illustrates how the block is centered and locked in the bar, and how the block can be removed without removing the key. Copy free on request.


No two workmen-
measure the same thing exactly alike
One measures roughly and another precisely.
That is why FEDERAL DIAL INDICATORS are being used more every day.
They eliminate human variations
FEDERAL
Send for special folder showing uses Bulletin No. 00
FEDERAL
PRODUCTS CORP.
1144 Eddy Street
Providence, R. I.

Speed Up Name Plate Numbering

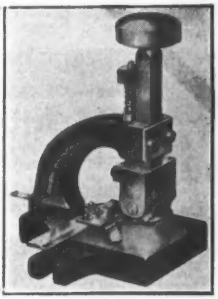
By Use of the New

NUMBERALL PLATFORM & QUICK CHANGE NUMBERING MACHINE

For brass, aluminum, and other soft metals hit the knob with the ball of the hand. Remove knob for hammer stamping untempered steel. Last wheel turned by means of knurled knob for consecutive numbering, other wheels changed by flipping up arm of platform.

Write for Literature and Latest Price Lists.

NUMBERALL STAMP & TOOL CO., Inc.
379 Huguenot Ave., Huguenot Park, Staten Island, N. Y.



DE-WITT OPERATED HOTELS

featuring—
Unusually Comfortable Rooms, Good Food, Carefully prepared, and Moderate Rates.

In CLEVELAND it's
• The HOLLENDEN

In COLUMBUS it's
• The NEIL HOUSE

In AKRON it's
• The MAYFLOWER

In TOLEDO it's
• The NEW SECOR

In SAVANNAH it's the
• General Oglethorpe

In DAYTON it's
• THE BILTMORE

In MIAMI BEACH it's
• The FLEETWOOD
An Exclusive Winter Resort Hotel

DISTINCTION

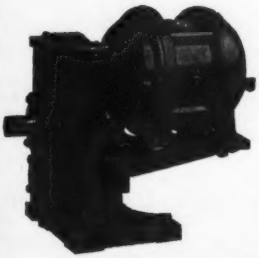
No address in all Chicago bears more distinction than that of the Auditorium Hotel on Michigan Ave. at Congress Street.

$3 SINGLE $5 DOUBLE
WITH BATH

AUDITORIUM HOTEL

Geo. H. Min
Manager

MICHIGAN AVENUE
AT CONGRESS STREET
CHICAGO



CULLMAN SPEED REDUCERS

FOR
Motors From ⅛ to 15 H. P.
Send for Catalog

Cullman Wheel Company
1336 ALTGELD ST., CHICAGO, ILL.

"There's One in Every Shop" *By Wesser*

THE MUSHROOM MECHANIC
THAT FELLA MUSTA LEARNED HIS TRADE IN A BLACKSMITH SHOP!
SO YOU CLAIM TO BE AN EXPERT MACHINIST, EH? AND YOU POUND A LATHE FIXTURE WITH A SLEDGE HAMMER, DO YA? WHADDA YA SUPPOSE WE HAVE BABBITT HAMMERS FOR?
I'M NOT THE ONLY NUT AROUND HERE!
Burt Wesser

Vascoloy-Ramet Chart of Brinell, Rockwell and Scleroscope Conversion Hardnesses

The Vanadium-Alloys Steel Company has prepared a useful cardboard chart of conversion hardnesses of Brinell, Rockwell and Scleroscope for the use of machine shops using Vascoloy-Rament tools. The chart also contains a list of the grades of Tantalum Carbide compositions. A copy of this convenient wall chart will be mailed gratis on application to the Vanadium-Alloys Steel Company, North Chicago, Illinois.

Mention MODERN MACHINE SHOP when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

LANDIS BULLETIN No. C-82. This bulletin, issued by Landis Machine Co., Inc., Waynesboro, Pa., contains 8 pages of description of the "Little Landis" Pipe Threading and Cutting Machine. This machine is designed for cutting off and threading pipe and bolts in jobbing or maintenance shops and is designed to provide means for quickest possible set-up changes and to produce accurate, well-formed threads on all materials at minimum cost. Mechanical executives who desire to secure a copy of this catalog may do so by writing the Landis Machine Co., Inc., Waynesboro, Pa.

WANTED

BY LARGE CORPORATION

Man to take charge of Metal Screw Cap Department. Large production of CT, IT, and wide mouth closures. Must have practical operating experience and be familiar with the construction of tools and equipment. Age 30 to 45. State experience over past ten years, with references, and approximate salary expected. All replies confidential; early decision promised.

MODERN MACHINE SHOP Box No. 7
704 Race St., Cincinnati, Ohio

The New Stackbin Section

Patented

MAKES A STOCKROOM AS EASY TO BUILD AS A SECTIONAL BOOKCASE

The Stackbin Section is designed so that one-section-nests-into-the-other, and sections nest deeply enough so that several placed one on top of the other provide a substantial unit. Ideal for temporary stockrooms near the job. Base separate. Counter top can be supplied. Write for circular and prices.

STACKBIN CORPORATION
TROY ST. PROVIDENCE, R. I.

Increase Your
Polishing and Buffing
Production *with*

• PACKER •

Automatic Polishing and Buffing Machines

THE PACKER MACHINE COMPANY
Meriden, -:- Connecticut
Write for "Prod. Increase Book"

ORDER BEFORE THEY GO

LOTS OF 50
$1.00 each

Lots of 100 less 3% Lots of 200 less 5%

J. L. LUCAS & SON, INC.
BRIDGEPORT, CONN.

The Vinco Angle Tangent to Radius Dresser

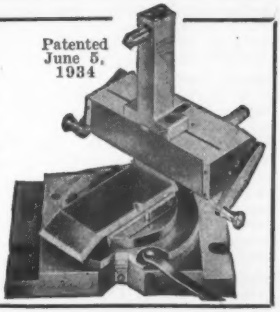
For External, Internal and Surface Grinding Machines

Based on its merit the Vinco Angle Tangent to Radius Dresser deserves to be standard equipment in every grinding department. It will save you 75% in dressing costs and eliminate all your worry and uncertainty in dressing angles and radii tangent to each other on abrasive wheels. It is precision made of the finest materials, all parts subject to wear are hardened, ground and lapped. It is the only angle tangent to radius dresser on the market, made and sold under our basic patent. It is fully guaranteed to be satisfactory.

Send for Descriptive Circular.

VINCO TOOL CO. 7354 CENTRAL AVE. DETROIT, MICHIGAN

Patented June 5, 1934



INDEX TO ADVERTISEMENTS

Acme Industrial Co. 173
Acorn Wire and Iron Works 39
Allis-Chalmers Mfg. Co. 87
American Hollow Boring Co. 149
American Saw & Mfg. Co. 155
American Swiss File & Tool Co. 191
Ames Company, B. C. 169
Anderson Bros. Mfg. Co. 140
Arguto Oilless Bearing Co. First Cover
Armstrong-Blum Mfg. Co. 85
Armstrong-Bray & Co. 178
Armstrong Bros. Tool Co. 34
Atlantic Gear Works Inc. 192
Atlas Press Co. 132
Auditorium Hotel 187
Avey Drilling Machine Co. 28

Baldwin-Duckworth Chain Corp. 49
Bantam Ball Bearing Co., The 116
Barber-Colman Company 22
Bath & Co., Inc., John 31
Battenfeld Company, The 185
Baumbach Mfg. Co., E. A. 177
Blanchard Machine Company 12
Bond Company, Charles 144
Boye & Emmes Machine Tool Co., The 165
Breuer Electric Mfg. Co. 166
Bridgeport Pattern & Model Works 143
Brown & Sharpe Mfg. Co. 27, 180
Buckeye Portable Tool Co., The 151
Buffalo Forge Company 30
Bunting Brass & Bronze Co., The 104

Calculagraph Co., The 150
Canedy-Otto Manufacturing Co. 177
Carboloy Company, Inc. 32
Carborundum Company, The 95
Chelsea Fan & Blower Co., Inc. 68
Chicago Pneumatic Tool Company 61
Chicago Tool & Engineering Co. 170
Chicago Wheel & Mfg. Co. 88
Cincinnati Bickford Tool Co., The 16
Cincinnati Electrical Tool Co., The 56
Cincinnati Gear Co., The 174
Cincinnati Milling Machine Co., The 6, 7
Cincinnati Planer Co., The 121
Cincinnati Shaper Co., The 41
Circular Tool Company, Inc. 161
Cleereman Machine Tool Co. 25
Clover Manufacturing Co. 173
Colonial Bushings, Inc. 163
Columbia Nut and Bolt Co., Inc. 179
Columbia Tool Steel Company 180
Commercial Centerless Grinding Co. 160
Comtor Company, The 152
Continental Machine Specialties, Inc. 114
Craley Manufacturing Co., C. C. 170
Cullman Wheel Company 187
Cumberland Steel Co. 154

Dalrae Tools Co. 55
Davis Keyseater Company 138
Dayton Rogers Mfg. Co. Third Cover
Delta Mfg. Co. 169
Desmond-Stephan Mfg. Co., The 152
Detroit Rex Products Co. 69
DeWitt Operated Hotels 187
Diefendorf Gear Corporation 156
Dreis & Krump Mfg. Co. 145
Dreses Machine Tool Company 139
Dumore Company, The 59
Durant Mfg. Co. 141

Edgemont Machine Company 176
Erie Concrete & Steel Supply Co. 160

Ettco Tool Company 50
Ex-Cello-O Aircraft & Tool Corp. 15

Farrel-Birmingham Company, Inc. 134
Federal Products Corporation 186
Fellows Gear Shaper Company, The 9
Flexible Steel Lacing Co. 158
Foote-Burt Company, The 26
Foote Gear Works, Inc. 163
Fosdick Machine Tool Co., The 14

Gairing Tool Company, The 157
Gammons-Holman Co., The 81
General Electric Vapor Lamp Co. 123
Genesee Manufacturing Co. Inc. 175
Geometric Tool Company, The 53
Gerding Brothers 176
Gerstner & Sons, H. 152
Goddard & Goddard Co., Inc. 131
Grant Mfg. & Machine Co., The 167
Greaves-Klusman Tool Company 144
Greenerd Arbor Presses 136
Greenfield Tap & Die Corp. 57
Groetchen Tool & Mfg. Co. 170
Gwilliam Company, The 157

Hamilton Manufacturing Co. 112
Hardinge Brothers, Inc. 77
Harnischfeger Corporation 64
Haskins Company, R. G. 125, 141
Hevi Duty Electric Company 99
Hjorth Lathe & Tool Company 148
Holo-Krome Screw Corp., The 63
Horat Manufacturing Company, J. 168

Illinois Testing Laboratories, Inc. 178
Ingersoll Milling Machine Company 11
International Machine Tool Co. 20

J. & H. Electric Co. 161
Jacobs Manufacturing Co., The 119
Jarvis Co., The Charles L. 19
Jones & Lamson Machine Co. 4, 5
Junkin Safety Appliance Co., Inc. 143

Karelsen, Inc., E. 170
Knight Machinery Co., W. B. 8
Koebel Diamond Tool Co. 122

L-W Chuck Company 179
Landis Machine Co., Inc. 2
Landis Tool Company 65
Le Blond Machine Tool Co., The R. K. 24
Leitz, Inc., E. 53
Lincoln Electric Company, The 153
Linley Bros. Co. 140
Logansport Machine Inc. Second Cover
Lovejoy Tool Works 178
Lucas & Son, Inc., J. L. 189
Lufkin Rule Co., The 111
Lyon Metal Products, Inc. 181

M-B Products 156
Mall Tool Company 182
Manley Products Corp. 185
Marburg Brothers, Inc. 177
Marquette Mechanical Engineering Co. 139
Massachusetts Gear & Tool Co. 141
Master Machine & Tool Company 184
Maxwell Company, F. A. 159
McCrosky Tool Corp. 147
McGonegal Manufacturing Co., The 181
McMahon Company, Frank 132
Midwest Tool & Mfg. Co. 151
Millers Falls Company 128

Modern Collet & Machine Co. 92
Modern Machine Shop 183
Modern Tool Works 3
Monarch Machine Tool Co., The 23
Morris Machine Tool Co. 124
Morse Twist Drill & Machine Co. 129
Mummert-Dixon Company 179

Nicholson & Co., W. H. 168
Nicholson File Company 109
Norgren Co. Inc., C. A. 175
Norma-Hoffmann Bearings Corp. 107
Norton Company 96, 97
Numberall Stamp & Tool Co. Inc. 187

Oakite Products, Inc. 166
Odin Universal Corporation 126
Ohio Machine Tool Co., The 13
Oliver Instrument Company 72
Oliver Machinery Company 110
Onsrud Machine Works 179
Osgood Handle Co., J. L. 164

Packer Machine Company, The 189
Parent Metal Products, Inc. 183
Parker-Kalon Corp. 137
Pioneer Engineering & Mfg. Co. 147
Porter Machine Co. 168
Pratt & Whitney Company 10
Procunier Safety Chuck Co. 130
Production Machine Company 162
Progressive Tool & Cutter Company 146
Putnam Tool Co. 169
Pyrometer Instrument Co. 180

Quality Tool Works 164

Rahn Larmon Company, The 160
Renu Tool Co. 157
Rhoades Metaline Co., R. W. 164
Richardson Company, The 71
Rivett Lathe & Grinder Inc. 143
Rockford Drilling Machine Co. 108
Ross Operating Valve Co. 91
Rotary File Co. 176
Rotor Air Tool Company, The 161
Russell Electric Co. 164
Ruthman Machinery Co., The 142

S. & S. Machine Works 178
Schauer Machine Co. 140
Scherr Company, Inc., George 192
Schmidt, Inc., Geo. T. 94, 147
Scully-Jones & Co. 165
Sellers & Co., Inc., Wm. 17
Seneca Falls Machine Co. 172, 175
Service Caster & Truck Co. 171
Sheffield Gage Corporation 103
Sheldon Machine Co. 171
Shepard Niles Crane & Hoist Corp. 118
Sidney Machine Tool Co., The 167
Simonds Saw and Steel Co. 93
Skinner Chuck Company, The 181
Smit & Sons, Inc., J. K. 155
Socony-Vacuum Oil Co., Inc. 82, 83
South Bend Lathe Works 51
Speedway Manufacturing Co. 184
Stackbin Corporation 189
Standard Electrical Tool Co. 176
Standard Oil Company (Indiana) *
Standard Pressed Steel Co. 117
Standard Tool Co., The 163
Stanley Works 153
Star Machine & Engineering Corp. 149
Stark Tool Company 145
Starrett Company, The L. S. 79
Sterling Grinding Wheel Co., The 115
Strand & Co., N. A. 153
Strippit Corporation, The 185
Sturdimatic Tool Company 182
Sutton Tool Company 155

Taylor Machine Co., The 168
Taylor-Shantz, Inc. 185
Threadwell Tap & Die Company, The 136
Timken Roller Bearing Co., The 1
Tomkins-Johnson Company, The 106

Union Drawn Steel Company 113
Universal Engineering Company 148, 159
United States Drill Head Co. 145
United States Electrical Tool Co. Fourth Cover

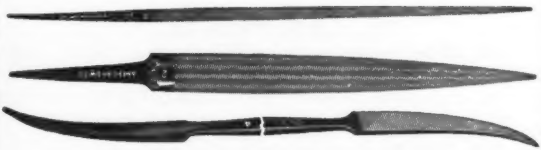
Vacuum Cup Metal Pulley Co., Inc. 184
Van Norman Machine Tool Co. 21
Vascoloy-Ramet Division, Vanadium-Alloys Steel Company 73
Victor Saw Works 105
Vinco Tool Co. 189

Waldron Corporation, John 159
Walker Co., Inc., O. S. 132
Walker-Turner Co., Inc. 174
Walls Sales Corporation 149
Waltham Machine Works 171
Warner & Swasey Co. 43
Watts Bros. Tool Works 144
Weldon Tool Company, The 47
Wells Manufacturing Corp. 29
Wheel Trueing Tool Co. 173
Wheelock, Lovejoy & Co., Inc. 151
White Dental Mfg. Co., The S. S. 127
Whitney Metal Tool Company 136
Wicaco Machine Corporation, The 167
Wiedemann Machine Company 18
Willey's Carbide Tool Co. 183
Williams & Co., J. H. 89
Wilson Mechanical Instrument Co. Inc. 67
Wright Manufacturing Co. 135

Yale & Towne Mfg. Co. 133

Zeh & Hahnemann Co. 139

*Zone Insert.



Over 2000 Regular Shapes, Cuts and Sizes.

AMERICAN SWISS FILE & TOOL CO.

ELIZABETH NEW JERSEY

TOOL & DIE MAKERS ! ! !

USE

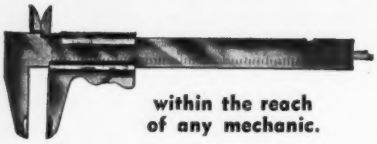
AMERICAN SWISS FILES

TRADE ONLY THE BEST MARK

MAUSER

PRECISION VERNIER CALIPERS

Reading in thousandths of an inch; at reasonable prices,



within the reach of any mechanic.

Height Gauge No. 533/8"

Our special proposition to firms places these calipers in the hands of your mechanics at installment payments as low as $2.00 per week. Your men, equipped with our calipers, are in a position to take any measurements inside, outside, or depth, thus eliminating the practice of borrowing tools among the men or frequent trips to the tool room.

A few types are shown on this page, others are listed in our 15-page catalog.

Other new indispensable tools are:

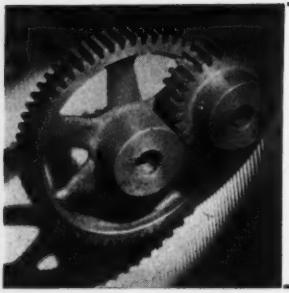
- ☐ Mauser straight edges with insulation holder.
- ☐ Combined stainless steel rule and protractor — New —.
- ☐ Mauser Depth Gauge, with vernier in thousandths; quick, sensitive. Enters small holes.
- ☐ Carl Zeiss Binocular Head Magnifier.

Ask for free catalog.

Shop agents and dealers wanted everywhere.

GEORGE SCHERR CO.

130 Lafayette St., New York, N. Y.



SPECIAL **GEARS** STOCK

Our service comprises the entire field from small gears for instruments to large, heavy industrial gears.

ANY TYPE — ANY MATERIAL

Quick deliveries on breakdown jobs and Original Westinghouse Micarta noiseless motor pinions.
ASK FOR FREE COPY of our catalog with prices on standardized stock items or send blueprints for estimate on special gears.

ATLANTIC GEAR WORKS, Inc.
130 LAFAYETTE ST., N. Y. C., N. Y.